NEW ZEALAND JOURNAL OF Agriculture

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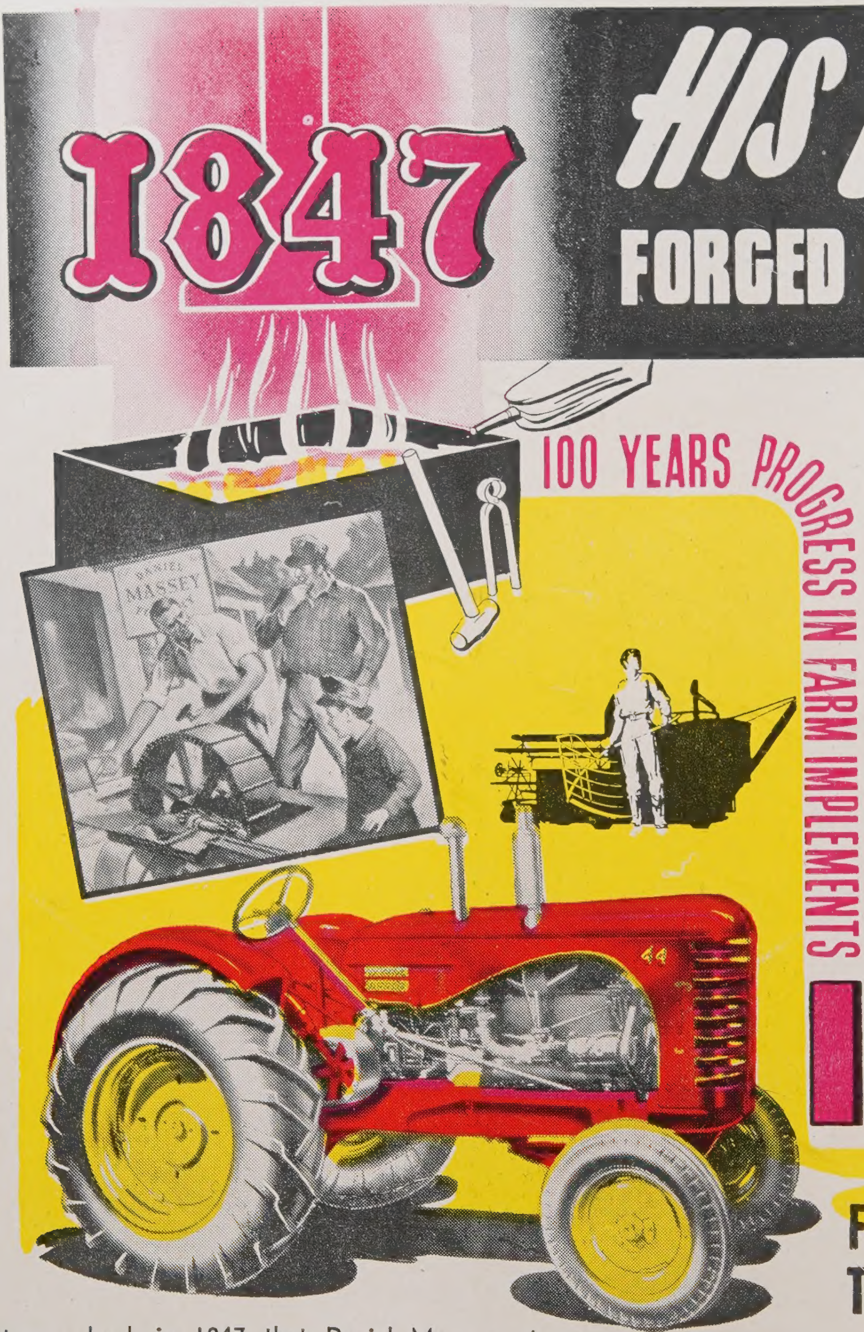
ALLAN MITCHELL

1847 HIS FORGE—FORGED AN INDUSTRY


100 YEARS PROGRESS IN FARM IMPLEMENTS
DANIEL MASSEY
44

It is one hundred years since the tiny foundations, which were to form the basis of this world-embracing company, were laid. One hundred years in which, by the introduction and continuous improvement of farm machinery, man has been liberated from the back-breaking and deadening toil with which he was then forced to earn his livelihood.

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Volume 75
Number 4
October 15,
1947.
(Established 1910)

NEW ZEALAND JOURNAL OF Agriculture

Published by
Direction
of
Hon. E. L. Cullen,
Minister of Agriculture.

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This month's cover

A group of Hereford beef cattle in the shade of willows and poplars has been painted for this month's cover by Allan Mitchell from a photograph by courtesy of the "New Zealand Farmer." Beef cattle are maintained on sheep farms primarily as a means of pasture control, the number of cattle carried varying considerably with the class of country. Generally North Island hill-country farmers run one cattle beast for every 10 sheep, and the intensive fat lamb farmer in high rainfall areas one cattle beast for every 15 to 20 sheep.

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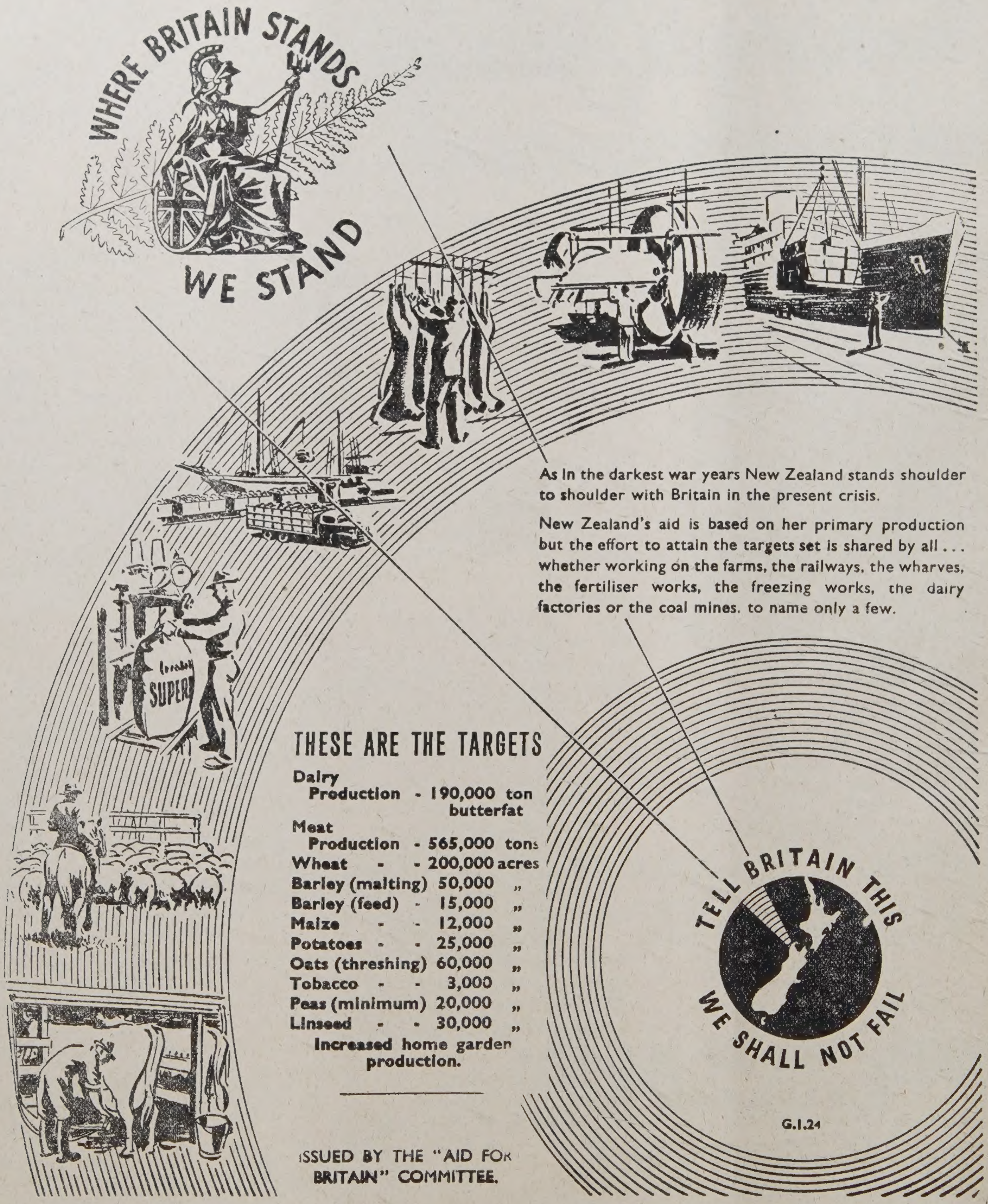
SUBSCRIPTION RATES

The *Journal* is issued monthly. The subscription within New Zealand is 2s. 6d. a year; the overseas subscription is 5s. The *Journal* may be ordered from any bookseller or newsagent, or direct from any office of the Department of Agriculture.

REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE.


WHERE BRITAIN STANDS WE STAND
SUPER
TELL BRITAIN THIS WE SHALL NOT FAIL

As in the darkest war years New Zealand stands shoulder to shoulder with Britain in the present crisis.

New Zealand's aid is based on her primary production but the effort to attain the targets set is shared by all . . . whether working on the farms, the railways, the wharves, the fertiliser works, the freezing works, the dairy factories or the coal mines, to name only a few.

THESE ARE THE TARGETS

Dairy Production	**- 190,000 ton butterfat**
Meat Production	**- 565,000 tons**
Wheat -	**- 200,000 acres**
Barley (malting)	**50,000 „**
Barley (feed) -	**15,000 „**
Maize -	**- 12,000 „**
Potatoes -	**- 25,000 „**
Oats (threshing)	**60,000 „**
Tobacco -	**- 3,000 „**
Peas (minimum)	**20,000 „**
Linseed -	**- 30,000 „**

Increased home garden production.

ISSUED BY THE "AID FOR BRITAIN" COMMITTEE.

G.1.24

INCREASED POTATO PRODUCTION NEEDED

New Price Schedule Assures Payable Crops

POTATOES form an essential part of the daily diet of New Zealanders, and a regular and adequate supply is therefore important to the community. If potatoes, which are easily grown and a profitable crop in New Zealand, form a substantial part of menus, consumption of other foods is correspondingly reduced, providing an increased surplus for export. Home gardeners can help substantially in the campaign for increased production by devoting as much space as possible this season to a potato crop, and I appeal also to commercial growers to increase the acreage in potatoes this season.

The problems associated with the maintenance of the potato supply are worth some consideration. In the first place, the potato is a perishable commodity, and the maintenance of a regular supply throughout the year involves on the one hand out-of-season production and consequent reduced yields, and on the other hand storage over a considerable period with inevitable storage losses. Secondly, potato yields are very subject to fluctuation with the season and the incidence of disease. In recent years the average yield of table potatoes has ranged from 3 1/3 to 5 tons an acre, which involves a variation from the mean of 20 per cent. in either direction.

Then there is the fact that no reliable outlet, either by processing or by export, exists to take care of the surplus production in favourable seasons. Conversely, there is no assurance of potatoes being available from overseas in the event of a short crop.

Again, the growing of potatoes on a commercial scale requires considerable labour. Despite the introduction of mechanisation to the industry, the employment of outside labour at harvesting time is still essential, and this at a time of the year when the weather can be very fickle, to say the least.

With all these factors mitigating against stability in the industry, only during the war and since has uncertainty of price been removed as a further source of worry to the potato grower. Before the war prices were subject to fluctuation according to the crop, and might vary from the cost of digging in glut years to more than £20 a ton in lean years. Such conditions also provided a fertile field for the operations of the "potato speculator." Since 1942 the marketing of potatoes has come within the sphere of price control, and, with the added protection of contracts extended to growers, it has been possible to give stability to one of the upsetting factors in potato production.

This stability, I believe, has been appreciated alike by growers, consumers, and distributors. However, it arose out of a set of emergency conditions, and now that those conditions have disappeared the parties interested in potato production are giving attention to the possibility of establishing a planned industry which will remove to the greatest possible extent the gamble associated with pre-war production. During the war the industry, through its representatives on the Potato Advisory Committee, co-operated to the fullest extent with the Government to ensure maintenance of production at the desired levels, and I know a continuation of that same spirit of co-operation will help to place the industry in a more satisfactory position than it was in pre-war years.

The acreage devoted to potatoes has recently fallen below that estimated to meet New Zealand requirements, and in view of the world food position every effort must be made to ensure that at least 25,000 acres are grown this season.

Officers of the Department of Agriculture last season undertook a comprehensive survey of the costs of potato production, and as an outcome growers' prices for main crop potatoes during the 1947-48 season have been increased. The adjustment amounts to an overall increase of £1 a ton above the 1946-47 prices, with an additional increase of 10s. a ton for Dakotas grown in the South Island, this variety now being included in the premium price group. A schedule of prices which will be paid to growers for f.a.q. grade main crop potatoes delivered next year is set out elsewhere in this issue of the "Journal."

As growers are aware, subsidy adjustments relating to farm production are now being arranged. The schedule set out has not made provision for these adjustments as they affect potato production costs—particularly of sacks and fertilisers—but when finality has been reached the prices already announced will be examined again with a view to making any adjustment which may be found necessary to meet the altered costs of production.

Though it is fully realised that any schedule of prices cannot be expected to eliminate all the production problems which the potato grower is required to face, the information supplied by growers to Departmental officers during the cost survey indicates that the price schedule adopted for the 1947-48 crop is a payable one. This fact, together with the assurances to the grower under the system of contract growing, which is to be continued in the coming season, will at least remove from the mind of the potato grower concern about the possibility of over-production. I believe that potato growers will realise the value of that security and, in view of the difficulties associated with food production today, that they will be prepared to produce the Dominion's requirements of potatoes.

EDWARD CULLEN, Minister of Agriculture.

NEW ZEALAND'S PART IN AIDING BRITAIN

ALONG with other members of the British Commonwealth New Zealand has promised Great Britain to do its utmost to help the British people through the present economic crisis. The first step in fulfilling that promise was the recent Aid for Britain conference, at which all national organisations were represented. The conference's recommendations of increasing the Dominion's production and exports to Britain, reducing dollar expenditure, and saving sterling funds by keeping imports from Britain to a minimum are being implemented by the Aid for Britain National Council, which the conference set up.

The members of the council, which is representative of different interests, are as follows: Mr. F. P. Walsh (Stabilisation Commission), chairman, Mr. H. E. Blyde (Dominion vice-president of Federated Farmers of New Zealand), Mr. W. J. Truscott (president of the New Zealand Manufacturers' Federation), Hon. R. Eddy (New Zealand Workers' Union), Mr. K. McL. Baxter (secretary of the New Zealand Federation of Labour), Mr. H. Anderson (Associated Chambers of Commerce of New Zealand), Mr. H. G. Kilpatrick (New Zealand Freezing Workers' and Related Trades' Union), Mr. F. Crook (United Mine Workers' Union), and Mr. D. A. Robertson (Overseas Shipowners' Allotment Committee).

The recommendations of the council are sent direct to the Prime Minister and Cabinet and have been promised full Government support. The council has its own publicity organisation, its women's auxiliary, and has planned the setting up of 20 district Aid for Britain committees this month. Working alongside the council is the Federated Farmers' national organisation.

The council and its supporting bodies can work only with the support of every individual, and to that end the national effort is being co-ordinated.

The key to the task lies in greater output, both for export and to save imports. Because the season is now well advanced, the call to farmers is urgent. Higher production targets have been set and it is the job of the council to ensure their achievement. Problems already considered include production and delivery of fertiliser, increased maize and potato production, farm machinery, fencing wire, availability of chou moellier seed, use of all possible land, tobacco growing, and voluntary labour for harvesting. More workers have been obtained for fertiliser plants, delivery difficulties are being removed, the import of 25 machine corn pickers for the maize harvest has been arranged, and the Government has adopted a recommendation of the council to prohibit the killing of lambs for consumption in New Zealand with a dressed weight not exceeding 30lb. until November 3 in the North Island and November 24 in the South Island. Many other matters are being discussed and investigated.

In addition, all other groups are being asked for greater efforts. The council knows that emphasis must be placed on urgency and the need for coordination and it is these essential points that it wants individuals to realise. Because labour and machinery are scarce, the aim can be achieved only through greater output per person.

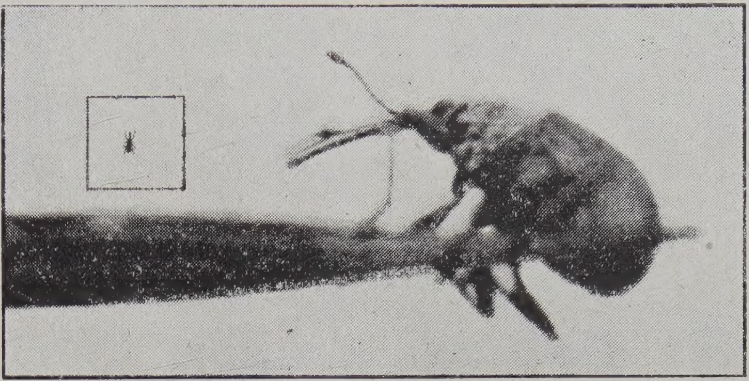
[*Photo News Ltd. photo.*

The Aid for Britain National Council. From left: Mr. D. A. Robertson, Hon. R. Eddy, M.L.C., Messrs. F. Crook, H. Anderson, H. E. Blyde, F. P. Walsh (chairman), R. F. Wilson (secretary), A. W. Menzies (assistant secretary), W. J. Truscott, and H. G. Kilpatrick. Absent: Mr. K. McL. Baxter.

Control of Gorse by Seed Weevil

By D. MILLER,
Cawthron Institute, Nelson.

THOUGH gorse is a weed of major importance in New Zealand, covering extensive and increasing areas of poor and fertile land, it is of considerable value in many localities as fences, shelter, and even fodder. Therefore, when the attempt to control gorse by means of insects was undertaken, it was decided not to aim at destroying the plant but to concentrate on the destruction of developing seed to check the spread of the weed. Europe and Great Britain were searched for suitable insects, particular care being taken that only those which confined their attentions to gorse seed were chosen.



[*W. C. Davies photo.*

Fig. 1—The gorse seed weevil. Inset left: The weevil natural size.

THE seed weevil (*Apion ulicis*) was finally selected in 1927 and researches on it inaugurated. The purpose of those researches was to secure information on the habits of the insect and to prove that it did not attack leguminous seeds of economic importance. That work was first carried out in England and later in New Zealand, under strict quarantine conditions as a further precaution. The only legume other than gorse attacked by the weevil was found to be broom; if the weevil would devote more attention to that plant, New Zealand would benefit greatly, but unfortunately it has not so far.

Gorse has two main flowering and seeding periods, one in the autumn and the other in late winter and spring. The autumn flowering is not prolific and comparatively few seeds are produced at that time—indeed, sometimes pods are found to contain no seeds, which doubtless has given rise to the claim that a seedless strain of gorse exists. Further, the percentage of viable seeds produced from the autumn flowering is comparatively low.

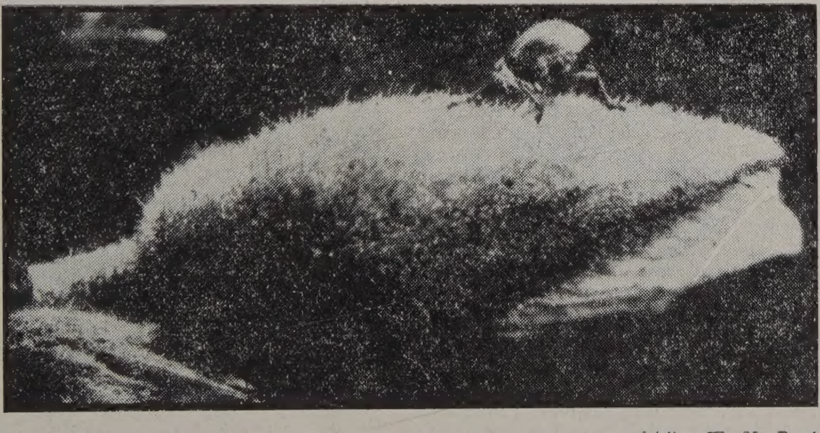
The late winter and spring flowering is copious, and from it the main crop of seeds is produced. These are the seeds mainly destroyed by the seed weevil, though the insect has been found to attack the autumn pods; that might be a new departure by the insect under New Zealand conditions, and if so its development would be of great importance.

Habits of the Insect

The gorse seed weevil is a hard-bodied, pear-shaped insect a little more than 1/12in. long and having a long curved snout (Fig. 1). A clothing of minute scales gives it a greyish colour, but sometimes these scales become rubbed off, revealing the ground colour, so that individual blackish weevils may be found with the normal greyish ones.

The weevils live on gorse bushes throughout all their life stages. They are strong fliers, which enables them to spread naturally over considerable distances, mountain barriers being no serious obstacle. In the winter a careful search will reveal the weevils on gorse bushes at the bases of buds and spines, where they resemble minute greyish buds. On sunny and warm winter days, however, they are stimulated to temporary action. At the close of winter the weevils become active and feed on the young shoots and spines, though without causing any appreciable damage; later they feed on the flowers, eating out conspicuous holes.

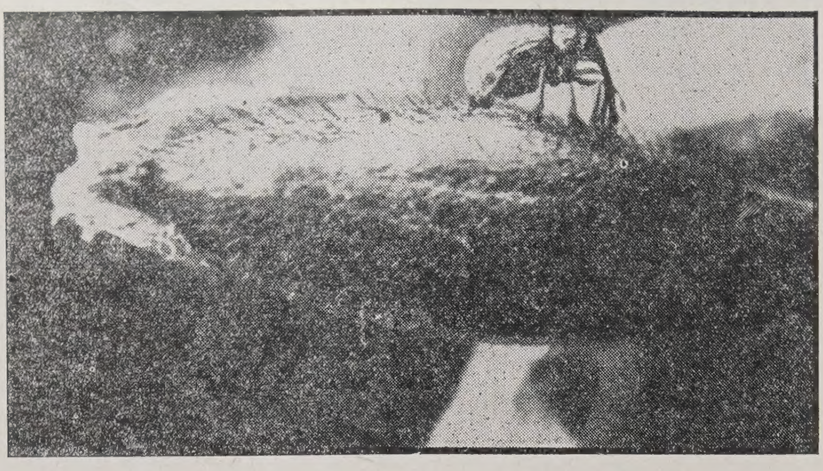
When the gorse comes into bloom in late winter and early spring the weevils mate and eggs are laid in the green pods, especially young pods; eggs are not placed in pods that have turned black. The female weevil bores a hole with her snout into the seed chamber of the pod (Fig 2). When it is complete she withdraws the snout, turns round, and forces the eggs through the hole (Fig. 3), which gradually closes with the growth of the pod. The glistening, yellowish eggs are in clusters, which may be seen if the pod is opened (Fig. 4). Sometimes more than one weevil lays eggs in the same pod.



[*After W. M. Davies.*

Fig. 2—The female gorse seed weevil boring a hole into the seed chambers of the gorse pod.

After about four weeks the grubs (Fig. 5A) hatch from the eggs and attack the seeds, which may or may not be entered but are finally destroyed. In from six to eight weeks the grubs grow to their full size, when they transform to the pupal or resting stage (Fig. 5B), and about two weeks later the adult weevils emerge from the pupae (Fig. 8). Thus, when the pods burst open weevils are scattered and not seeds. Sometimes, especially



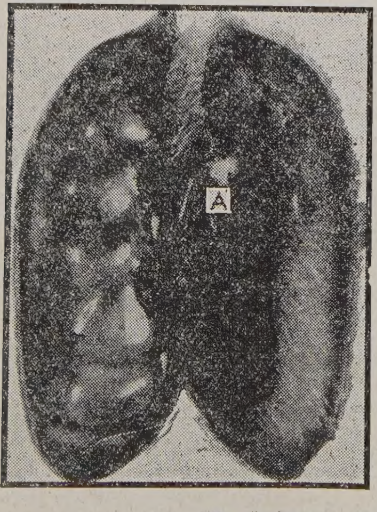
[*After W. M. Davies.*

Fig. 3—The female weevil forcing eggs through the hole bored in the pod.

during wet seasons, pods do not open, but the imprisoned weevils can remain alive for quite a long time. Weevils develop from pods during December and January in Nelson and as late as March and April in Otago.

Establishment of Weevil

After the gorse seed weevil had been studied in New Zealand and England for some four years, all the evidence showed that gorse was its only host plant apart from broom occasionally. The position was then carefully considered and a decision reached that the weevil could be liberated. On February 5 and 7, 1931, the first field liberations were made in Nelson and near Alexandra, Central Otago. Between then and 1946 large consignments were collected and distributed widely throughout both islands. The points of liberation are listed at the end of this article and the position is shown on the maps on the opposite page. A total of 235,000 weevils has been distributed.



[*W. C. Davies photo.*

Fig. 4—An opened gorse pod, showing clusters of eggs (A) and seeds.

Doubtless the weevil is now thoroughly established wherever it has been liberated. There is definite information that that is so throughout the Nelson district bordering Tasman Bay, throughout Marlborough, Canterbury, the coastal region of North Otago, Bluff, Central Otago, Wellington and Taranaki Provinces, Hawke's Bay, along the main road to Auckland City, and at Whangarei. That good covers of the weevil exist is evidenced by the discomfort caused to anyone pushing through a gorse thicket in summer by the numbers of the insects invading the clothing. Also, in parts of the Nelson district, where gorse is sown for sheep, farmers were unable to secure sufficient seed even when 4s. a pound was offered.

The highest percentage of gorse pods found to be infested by the weevil in New Zealand is nearly 99, and from the present abundance of the insects it is likely that this high figure will become general. Even in England, where the weevil has to contend with its natural enemies, the percentage of pod infestation reaches 88, so complete infestation should not be impossible in New Zealand, where the natural enemies do not occur.

The number of weevils found in a pod varies from one to sixteen and all the seeds are destroyed except where no more than two insects have been active. It was found in England by W. M. Davies that three insects could account for all four to seven seeds in one pod, but that the same quantity of food could support the development of 16 weevils.

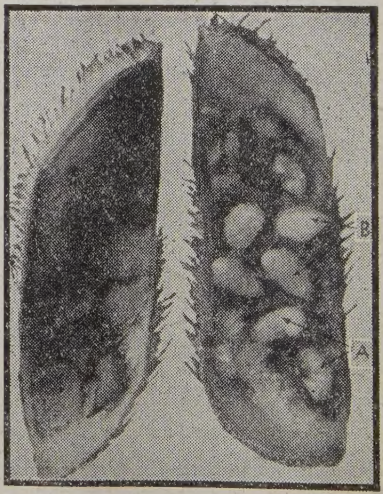
The burning of gorse destroys the weevils, but they return from unburnt areas when the gorse recovers. However, the weevils have to start from zero in such an area, and the percentage of pod infestation will be lower than on an unburnt area until a population has been built up. Where areas of gorse remain undisturbed for a number of years a very high proportion of infestation, approaching if not reaching 100 per cent., can be expected. The protection of gorse from fire is not advocated, but the question of burning in relation to the weevil is raised frequently.

Collection of Weevils

The Cawthron Institute receives innumerable requests from all parts of the country for supplies of gorse seed weevils, but as the insects are so well established the institute has given up distributing them. Anyone requiring supplies should read this article carefully, consult the accompanying maps, and help himself by carrying out the directions which follow.

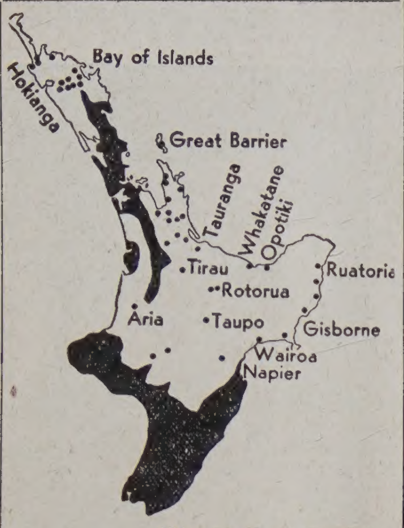
As nothing is to be gained by liberating weevils in places where they already occur, the first thing to do is to ascertain whether the insects are present. Closely examine the bushes in winter for the small greyish weevils clinging to the stems at the base of a bud or spine, or place a sheet of cardboard under an overhanging branch and hit the branch sharply with a stick, when the weevils will be shaken off on to the cardboard. If the examination is made in spring or summer, the weevils will be seen walking on the bushes, and opening up a few pods will reveal the grubs or weevils.

If the weevils are absent, arrange for them to be collected in an area where they are known to be established. That is best done during August or September by shaking the branches over a sheet of cardboard. Quantities of weevils, debris, and spiders will fall on the cardboard. At



[*W. C. Davies photo.*

Fig. 5—Pod, showing larvae (A), pupae (B), and destroyed seeds.



[*Map by E. S. Gourlay.*

Fig. 6—North Island, showing in black the universal spread of the weevil. The towns named show where the weevil has been liberated and from where it has most likely spread.

first the weevils will remain perfectly still but will soon crawl about, especially if exposed to the sun. They can then be swept with a small brush into a container, which is taken to where the weevils are required and the contents shaken out over the gorse bushes. The weevils withstand handling and transport, but care must be taken not to include spiders with them in the container.

Another method of securing supplies is from the blackened pods later in the season. Such pods can be collected and opened and the weevils placed in a container.

The question is often asked, "What will become of the weevils when there are no gorse seeds?" As long as there is gorse the seeds will be produced and attacked by the weevil year after year. If by some means gorse could be exterminated, the extermination of the weevils would be a natural corollary.

Points of Liberation

Mr. E. S. Gourlay had charge of the distribution, and the following are the places where gorse seed weevils have been liberated in New Zealand:—

Ahipara
Ahuroa
Akaroa
Albury
Alexandra
Alford Forest
Alton
Amberley
Arapito
Aria
Aromoho
Arrowtown
Ashburton
Auckland
Avondale
Awanui
Aylesbury

Balcairn
Balclutha
Balfour
Bankside
Barrytown
Berwick
Blenheim
Bluff
Brunswick
Bulls

Cambridge
Cape Foulwind
Carterton
Christchurch
Clandeboye
Clevedon
Coalgate
Collingwood
Colville
Coromandel
Cromwell
Culverden

Dairy Flat
Dannevirke
Darfield
Domett
Drury
Dunedin
D'Urville Island

Ealing
Eastbourne
East Tamaki
Eketahuna
Eltham
Evans Creek
  (Westland)
Eyreton

Fairlie
Featherston
Ferguson's
Five Rivers
Fordell
Fortrose
Foxton
Frankton Junction

Geraldine
Gisborne
Glen Eden
Glen-iti
Gore
Grasslands (Otago)
Great Barrier Island
Great Mercury Island
Greenhills
Greenhithe
Greymouth
Greytown
Grove (Picton)

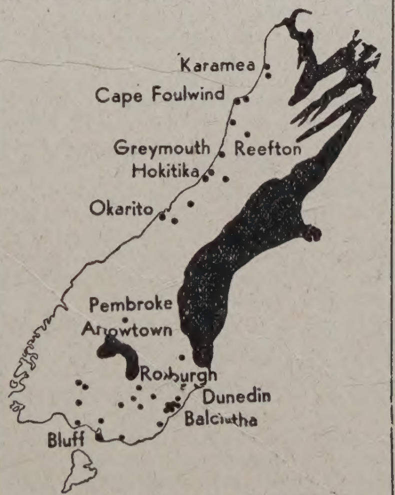
Hakataramea
Halfway Bay
  (Lake Wakatipu)
Hamilton
Hastings
Havelock
Hawarden
Hawera
Hawkeswood
Hazelburn
Henderson
Heretaunga
Heriot
Hikurangi
Hillend
Hillsborough
Himitangi
Hindon
Hobsonville
Hokianga
Hokitika
Hook
Hororata
Howick (Auckland)
Hunter (Waimate)
Huntly

Inchbonnie
Inglewood
Invercargill

Johnsonville

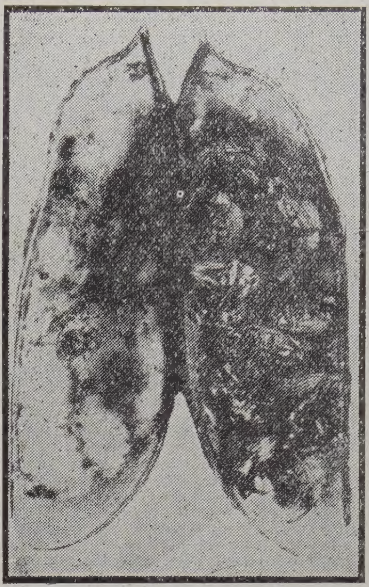
Kaeo
Kai-iwi (Wanganui)
Kaikohe
Kaikoura
Kaipara Flats
Kaitaia
Kaitoke
Kakaramea
Kakatahi
Karamea
Karori
Katikati
Kawakawa
Kerikeri
Kinohaka
Kohukohu
Kotinga (Takaka)
Kurow

Lauriston
Lawrence
Levin
Little River
Loburn
Lovell's Flat
Lower Hutt
Lower Moutere
Lowry Bay



[*Map by E. S. Gourlay.*

Fig. 7—South Island, showing in black the universal spread of the weevil. The towns named show where the weevil has been liberated and from where it has most likely spread.



[*After W. M. Davies.*

Fig. 8—Pod, showing weevils and absence of seeds.

McNab (Gore)
Makihikihi
Makirikiri
Manaia (Taranaki)
Mangamahu
Mangapai
Mangawai
Mangonui
Manurewa
Mapua
Maramarua
Martinborough
Marton
Marua
Masterton
Mata
Matakana
Matangirau
Maungati (Timaru)
Maungatua
Maungaturoto
Maxwell (Wanganui)
Mercer
Middlemarch
Miller's Flat
Milton
Moerewa
Morrinsville
Motueka
Motukarara
Motunau

Napier
Nelson
New Brighton
New Plymouth
Ngaruawahia
Nihotapu
Nightcaps
Northland
  (Wellington)
Nuhaka

Oakura
Oamaru
Ohaewai
Ohai (Southland)
Ohaupo
Ohinewai
Okaihau
Okarito
Okete
Okoia (Wanganui)
Oneroa
Opotiki
Opunake
Orari
Oratia
Orewa
Orton
Otaio
Otaki
Otaki Railway
Otane
Otautau
Otorohanga
Owaka

Paeroa
Paerua (Otira Line)
Pahiatua
Paihia
Pakawau
Palmerston North
Palmerston South
Papakura
Paparoa
Parakino
Paraparaumu
Patea
Patumahoe
Peel Forest
Pembroke
Picton
Pipiriki
Pirongia
Pokeno
Pollock Settlement
Pongaroa
Ponui Island
Porangahau
Puhoi
Pukekohe
Pukeroa
Puketitiri
Puketona (Ohaeawai)
Puniho
Puramahoi

Raetihi
Raglan
Rai Valley
Ramahiku
Ranfurly
Rangiora
Rangiriri
Rapanui
Ratana
Rawene
Red Vale (Auckland)
Reefton
Riverton
Riwaka
Rotorua
Roxburgh

GORSE SEED WEEVIL . . .

Ruatoria
Ruby Bay (Nelson)
Runciman (Wanganui)

Seacliff
Seafield (Wanganui)
Sherwood
Silverdale
Springfield
St. Andrews
St. Omer (Sounds)
Stoke (Nelson)

Tainui (Hokitika)
Taipuha
Taita
Tai Tapu
Takaka
Takapau
Tane
Tangoio (Napier)
Tataraimaka
Taupo
Tauranga
Tawa Flat
Te Akau (Raglan)
Te Aroha
Te Atatu
Te Awamutu
Te Hana
Te Houka (Balclutha)
Te Kauwhata
Te Kopuru
Te Kuiti
Te Mata
Te Ngae (Rotorua)
Temuka
Te Puke
Te Rou
Thames
Tikiponga
Timaru
Tinui (Wairarapa)
Tipapa
Tirau
Tiromoana
Tolaga Bay
Turakina
Turua

Upokopoito (Wanganui)
Upper Moutere (Nelson)

Waiau
Waihi
Waikanae (Bay of Islands)
Waikari
Waikawa Bay
Waikino
Waikouaiti
Waimate
Waimauku (Kaipara)
Waimea West
Wainui (Akaroa)
Wainui-o-mata
Waipahi (Otago)
Waipawa
Waipu
Waipukurau
Wairoa
Waitakaruru
Waitaki
Waitomo Caves
Waitotara
Waiuku (Auckland)
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Wanganui River
Warepa
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Wellington
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Whangarei
Wharehine (Kaipara)
Whatarangi
Whenuakite
Whitford
Windwhistle
Woodbury
Woodside (Wellington)

◆

Radio Broadcasts

RADIO talks to farmers will be given from Station 1YA Auckland at 7.15 p.m. on the following dates:—

November 3 — "Current Farming Problems," by J. E. Bell, Fields Superintendent, Auckland, A. J. Kerse, Fields Instructor, Auckland, and H. Woodyear-Smith.

November 10—"The Care and Handling of Livestock," by I. G. Watt, Veterinarian, Auckland.

November 17—"The Agricultural Chemist and the Fields Instructor," by Dr. E. B. Davies, Agricultural Chemist, Soil Fertility Research Station, Hamilton, and E. B. Glanville, Assistant Fields Superintendent, Auckland.

November 24—Young Farmers' Club session, by a representative of the Whangarei Y.F.C. district committee.

Farm news sessions are broadcast over main national stations every Thursday at 9.20 p.m.

◆

Death of Director of Fields Division

A CAREER devoted to the betterment of New Zealand farming in the service of the Department of Agriculture closed sadly on Sunday, September 28, with the death of Mr. James Moncrieff Smith, Director of the Fields Division, at the early age of 48 following a long and painful illness. The success of his work was the result of both his character and the full possession of those qualities that make for a successful instructor in agriculture. He understood farmers and farming; he wrote and spoke with confidence and authority; he possessed abundant energy and common sense, and in all his work he displayed an unfailing cheerfulness and ready wit, so that he was always the friend as well as the advisor of the farmer and his professional co-workers.

MR. Smith gained his early farming experience at Levin, where he passed the senior Civil Service examination and was awarded the Rural Scholarship in Agriculture at Levin High School in 1915, and later received practical farming experience as a cadet at the Weraroa Experimental Farm. He spent two years at the Hawkesbury Agricultural College, New South Wales, and gained the college diploma in 1917. He joined the Department of Agriculture in 1918 and was appointed student assistant at the Moumahaki Experimental Farm. In 1921 he was transferred to Wellington as Assistant Instructor in Agriculture and was later stationed at Marton and Wanganui. In 1926 he was appointed Instructor in Agriculture, New Plymouth, in 1934 Fields Superintendent, Dunedin, and in 1939 Fields Superintendent, Auckland. During the latter war years he was appointed Superintendent, Services' Vegetable Production, and in 1945 Director of the Fields Division.

During his service in the Department of Agriculture Jim Smith was well known and deeply respected by farmers in all parts of New Zealand. He believed that the advancement of farming depended on the close co-ordination of research and extension and that his work was to prepare farmers to receive new ideas and put them into practice. He felt that people were more important than things and that the first essential in agricultural extension work was to awaken a sense of good husbandry among farmers. To that end he was tireless in his work in the promotion of farmers' field competitions and Young Farmers' Clubs so that the fruits of research might fall on the ground of pride in good farming which he had prepared. His achievements in that direction reached a high standard between 1926 and 1934 when he was Instructor in Agriculture at New Plymouth. For, as a speaker at a Taranaki farewell gathering said of him in 1934: "He is a man who in his own quiet way has made a deep impression on us and on the dairy industry of Taranaki." Later, as Director of the Fields Division, he was in a position to guide the officers under his control in the philosophy that improvement in the technique of farming depends essentially on the mutual confidence between the farmer, the extension officer, and the research worker, and that friendly competition makes for the advancement of good farming.

The war upset the normal efficiency of the research and extension services of the Fields Division, as a large proportion of the staff was engaged for several years on special war work. In the comparatively-short period in which he was director he reorganised the division's extension services and research facilities so that it could again play its full role in the advancement of New Zealand farming. He supervised the establishment of the Soil Fertility Research Station, Hamilton, and the Irrigation Experimental Farm, Ashburton, as the division's research centres in each island.

From 1943 onward Jim Smith was not in good health and was frequently in physical discomfort. Yet, while he was charged with the difficult and onerous tasks of supervising the vegetable production campaign and the affairs of the Fields Division, he never allowed his own difficulties to stand in the way of his duty. His death ends a career of great achievement but of still greater promise.

◆

PRODUCTION OF MILK FOR TOWN SUPPLY

By G. F. L. HUDSON,
Dairy Inspector, Wellington.

MILK is such a complete and necessary food, especially for children, that only the very best product should be supplied, and the production of clean milk of good quality for town supply is very important. There is no doubt that clean, good-quality milk can be produced and delivered to consumers without deterioration; it is mainly with the production of such milk that this article deals.

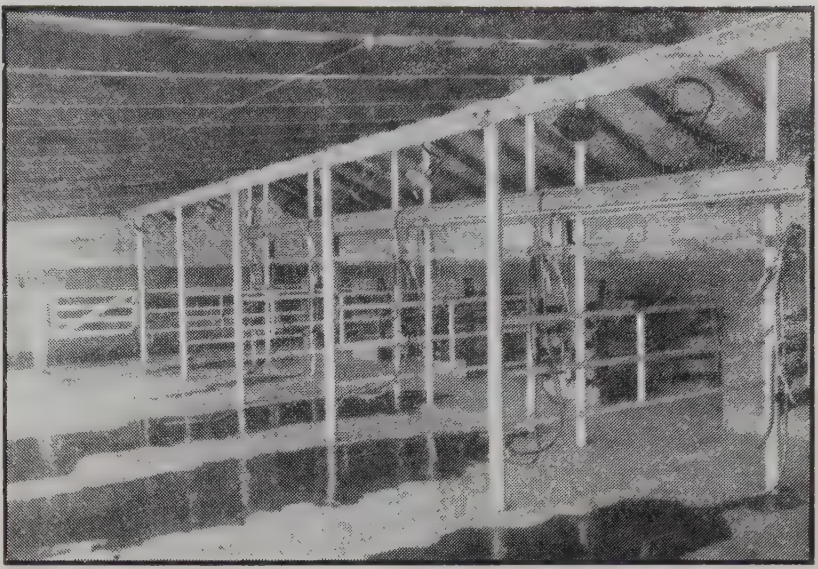

Fig. 1—The interior of a modern milking shed, showing the use of piping for construction of uprights, bail divisions, and dummies. Water is laid on to each bail for washing the cows' udders and teats.

THE production of first-grade milk entails greater effort, but from the producer's angle it is poor business and uneconomical to turn out anything but first grade, as losses are heavy when milk is graded down because of poor quality, and there is a complete loss when it is condemned.

The conditions under which milk is produced, the cows that yield it, and the labour and machinery used in obtaining it play an important part in deciding whether the final product will be good or bad. Records over a number of years show that where the farmer is careful in his management milk is seldom, if ever, degraded.

It is, however, much more difficult to produce first-quality milk from premises which are badly sited, badly constructed, and hard to clean than from buildings well sited and constructed with a view to permanence and easy and rapid cleaning. Therefore much thought and careful planning are necessary when new buildings for town supply milking are contemplated.

The Building Site

When new buildings are contemplated for the production of town supply milk the first important consideration is the site, and careful thought should be given to this and particularly to the following points:—

(a) Accessibility both in relation to grazing paddocks and the picking up or carting away of milk.

(b) The absolute necessity of an abundance of pure, cold water if possible from a well or bore close to the site.

(c) Facility for efficient drainage. Many well-built dairies have been spoilt because insufficient consideration was given to this matter. Good drainage is sometimes most difficult to ensure because of conformation of the land, but careful thought beforehand will often solve the problem.

The nature of the ground must also be taken into consideration. A herd of cows must be taken to and from the shed twice a day, and mud on a farm in winter is hard to avoid, but careful planning beforehand will help to obviate the worst of it. In some areas the provision of a concrete pathway extending some distance from the shed will overcome the mud nuisance.

In the selection of a site the Dairy Inspector, usually the Inspector of Stock for the district, should be consulted, as his knowledge and experience of many other sheds under local conditions will be of considerable help.

Construction of Buildings

A suitable plant for new buildings is the first consideration, but before this is decided on several important factors need thought: First, the likely maximum number of cows the farm will carry will determine the size of the shed to be built. It is unwise to build a shed for a two-cow plant if a four-cow plant will eventually be necessary. Alterations are most difficult and very costly.

The following table will give an idea of the number of cows that can be comfortably handled in sheds of different sizes:—

One-cow plant (2 stalls), up to 20 cows
Two-cow plant (4 stalls), 20 to 35 cows
Three-cow plant (6 stalls), 35 to 50 cows
Four-cow plant (8 stalls), 50 to 70 cows

It is not usually practicable to handle more than 70 to 75 cows in one shed. A larger herd is unwieldy, and it is rarely possible to give the individual attention both to feeding and general care which is absolutely necessary if the best returns are to be obtained. It is not entirely the size of the herd that determines the amount of milk produced; individual attention to the health and feeding of cows and during milking is also of material importance.

When the size of the shed has been decided and thus automatically the size of the milk room and the yard (the latter on the basis of 12 square feet of concrete for each cow), the type and construction must be considered. Milking has to be done in all sorts of weather, and a few extra pounds spent in giving added comfort during the work will be well paid.

The careful designing of yards with good fall for drainage and convenient layout will materially reduce time spent in bailing up for milking and in cleaning down after milking. Sound construction will reduce later maintenance and do away with need for alterations.

Concrete and steel, used more and more widely today, is the most permanent type of shed construction. The concrete walls are taken to roof height, with dummy bails, divisions, and uprights of piping, with welded joints. The only timber used is that for doors, purlins, and sarking. In the milk room the concrete walls are also taken to roof height, and, plastered on the inside to save lining and painting, will last a lifetime. Piping used for dummies, divisions, and uprights

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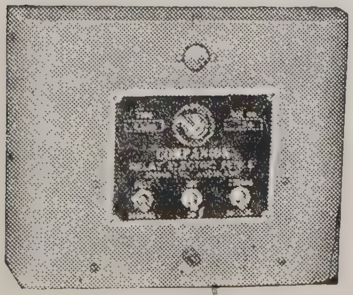

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has the advantage of being permanent as well as being easy to clean, while timber has only a limited life.

Easy and rapid cleaning of the shed and yard is facilitated if the fall is in one direction and to one focal drainage point—from the shed to one far corner of the yard. Incorporation of the walk-out race under the shed roof facilitates rapid cleaning, is more sanitary, and protects the doors from the weather, and in bad weather it prevents rain and wind from driving into the shed each time the doors are opened. An outside race also needs additional drainage, fencing, and cleansing.

Farmers who have worked in a shed with a covered race usually much prefer it to an outside one. It may be considered that in warmer climates a shed with an inside race would be too warm in summer, but if draught vents 9in. x 6in. are put in the walls about 3in. above the floor, especially in the milk room, the floor will be kept cool and dry. Louvres high up in one or more of the walls of the milk room to give air circulation near the ceiling are the best means of providing air circulation and light.

Air vents should be provided along the rear wall of the milking shed, with a shutter to close them in cold weather when milking is in progress, and a louvre could also be put in high up to give added cooling in warmer climates.

A new idea in shed roof design is illustrated in the type of shed shown in Fig. 2. This shed is warm in winter and cool in summer whatever the climate, and is likely to be widely used as farmers recognise its advantages.

The use of permanent materials for fences round holding yards is advisable. Lengths of old railway rails let into the concrete kerbs of yards are cheap and lasting, and old boiler tubes from railway engines either bolted to or passed through holes cut in rail posts make neat and permanent rails. Both used railway rails and boiler tubes can be obtained from railway workshops.

The milk room should house nothing but essential utensils such as releaser, vat, cooler, and milk cans.

The water heater, cupboard for rubberware, wash-up tub, vacuum pump, and motor and water pump should if possible be kept in a separate alcove which allows of easier cleaning of the milk room.

The Dairy Inspector should be consulted before building, as he will make available the advice and assistance of the Department on whose behalf he must finally pass and register the shed if suitable. A farmer may well be proud of an efficiently-constructed building which is easily and quickly cleaned and which in years to come will still be up to date and need a minimum of maintenance. Most important of all, from it, with ordinary care, the farmer can supply clean, wholesome milk.

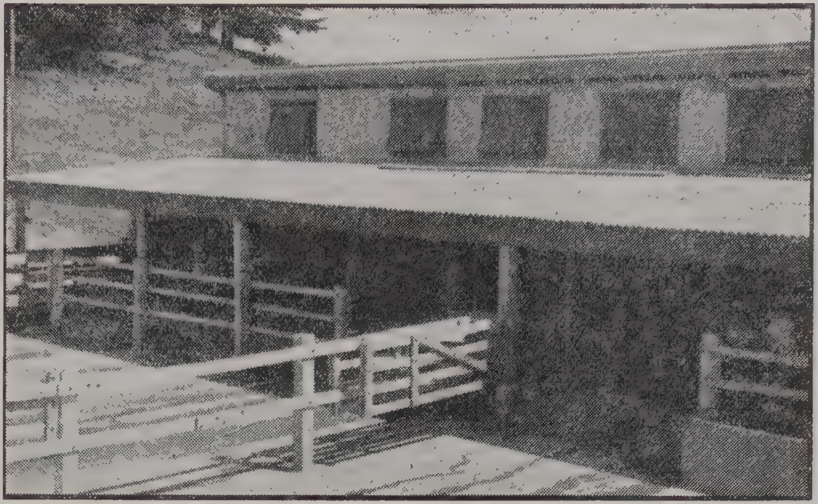


Fig. 2—This roof design enables part of the holding yard to be covered, giving greater protection in bad weather. Windows keep the shed cool and airy in summer. The interior of this shed is shown in Fig. 1.

Production of Clean Milk

As milk is one of the most important foods, as well as being so easily affected detrimentally by odours, dirty conditions, and diseases, the conditions under which it is produced and handled should be as clean as possible: cows from which it comes should be free from disease and in good condition, and those who handle the milk must be clean and in good health.

Milked cows standing round the shed waiting for milking of the whole herd to be completed encourage excessively muddy conditions which may be avoided if cows as they are milked are brought back into another yard adjacent to the holding yard. Though this means extra concrete and therefore a slightly higher cost, it is well worth while, as when cows have to walk through mud extra work is entailed in cleaning teats and udders, and unless this is done properly the quality of the milk will be affected.

Putting large stones or very rough metal in walk-out races cannot be too emphatically condemned, as the stones frequently cause bruising or laceration of the cows' feet, allowing the bacteria which cause foot-rot to gain entrance. Lame cows mean a big loss of production.

Water used for washing udders should be changed as often as possible and have a little condy's crystals added.

Cloths for washing udders should be frequently boiled to prevent the spread of udder disease. Water laid on in each bail facilitates the washing of udders hygienically.

The most frequent cause of milk being degraded is probably dirty milking plant, which is the result of carelessness. Only a short time is required for efficient cleaning, and it is hard to understand why some producers "slum" this work and risk the possibility of a lower grade and consequently a reduced price for their product. Carelessness in cleaning milking plant means, too, that the life of the machines will be shortened.

The practice often followed by many farmers of thoroughly cleaning machines in the morning and then just rinsing them out at night is useless. To clean milking machines thoroughly the following procedure should be followed both night and morning:—

First, thoroughly rinse out the milking plant with not less than a bucket of cold water (three to four gallons) through each set of cups.

Follow this with a bucket of boiling water to which has been added a teaspoonful of caustic soda through each set of cups.

Finally follow with a bucket of boiling water only in the same way.

Once a week at least caustic soda solution followed by boiling water should be drawn through the air line, as if milk which sometimes enters the air line as the result of "flooding" from the releaser is not removed it will soon smell and affect the quality of milk passing through the line.

As chlorine solutions or soap powders improperly used may cause tainting of the milk, their use is not recommended.

All rubberware should be overhauled frequently; cracked rubbers cannot be cleaned thoroughly and faulty inflations cause inefficient milking and may lead to degraded milk.

All utensils should be cleaned in a similar manner to the machines, then put inside the milk room upside down on a rack. Neither utensils nor milk cans should be left outside in the sun.

Personal cleanliness of the milker is very necessary; hands should be washed frequently; clothing should be clean, and the wearing of overalls is advantageous.

The "stripper cow" is another cause of inferior-quality milk, and milk from a cow on once-a-day milking should not be included in that for human consumption. The addition of a few pints of stripper milk may result in the whole consignment being degraded.

Cooling of Milk

For milk to "keep" satisfactorily it should be reduced to a temperature as near 40 degrees F. as possible immediately it is drawn from the cow to retard the growth of bacteria, which increase rapidly as the temperature of milk rises and affect the keeping quality of the milk.

Water is generally the agent used for cooling and it should be as pure and as cold as possible. Only water from a well or bore is suitable for efficient cooling, and the nearer the supply is situated to the shed the better. Water from a tank, stream, or dam is generally too warm in summer.

Faulty cooling is responsible for much degraded milk. To ensure satisfactory cooling the cooler should be large enough to allow the milk to spread over as large an area as possible to ensure its being reduced to the lowest possible temperature. A cooler of simple design with large corrugations is easiest to clean. Water presure should be sufficient to ensure the cooler being full all the time cooling is in progress.

The "freezer cooler," the best means of cooling milk, will reduce the temperature of milk to 40 degree F. very quickly, but such plants are as yet rather expensive for general use, though they are being more widely used, particularly in warmer districts.

Summary of Important Points

1. Milk only healthy cows.

2. Thoroughly wash and dry udders before milking.

3. Keep hands and clothes clean.

4. Keep all leg ropes, back chains, door handles, and stools clean. All are handled constantly and if left dirty are a sure source of infection and contamination.

5. Clean machines and utensils thoroughly after each milking.

Supplementary Feed in the Auckland Province

By A. D. MERCER, *Fields Instructor, Thames.*

WHEN pasture growth declines during dry summer weather and some form of supplementary feed becomes necessary, conditions differ in two important respects from those obtaining in the winter:

1. The feeding of dairy cows is for production, and not only for maintenance. It should therefore be on as liberal a scale as possible if returns are to be maintained.

2. The consumption by an animal of large quantities of root crops during cold weather entails a great drain on body heat to raise the temperature of the water consumed, and an allowance of hay is necessary to supplement the roots. In the summer the need is for green, succulent feed. Hay is neither necessary nor efficient for production, and should be reserved for the winter months.

Maize

In most of Auckland Province the most reliable greenfeed crop is maize. As it can be fed at any stage, it is available from January onward and should be mown and carted out to the cows. Used to supplement diminishing pasture growth, 1 acre of maize, well grown, will keep a herd of 40 cows for 1 month.

If the green maize is not required in a good grass season, it may be allowed to ripen for grain, but it is difficult to convert into silage in a stack because of the coarseness of the material. Unless a pit or silo is available it is therefore better, even if the maize crop is not required, to use it as greenfeed and close up an extra grass paddock for silage.

Japanese Millet

Though not very commonly grown, Japanese millet provides good summer feed if not allowed to mature. It is suitable for either cattle or sheep, and is best fed off in breaks before it reaches 1ft. high.

Turnips

Soft turnips are popular as summer feed for both cows and sheep, and if they are fed to cows immediately after milking the milk is not likely to be tainted. In some cases it is more convenient to pull and cart out the roots, but in dry weather there is no objection to putting the herd on to small breaks for a short period daily. Calves or lambs, which will pick mainly at the leaves, may precede the dairy herd on to each break.

Rape

Rape may be fed with discretion to dairy cows, but for either sheep or cattle it must be allowed to mature that is, to attain a purplish tinge in the leaves. In some seasons the crop does not appear to reach maturity in parts of Auckland Province, and to a large extent that accounts for its lack of flavour in those areas.

Lucerne

One of the most valuable of all summer feeds is lucerne in the green state. It should be mown and carted out, as grazing is detrimental to the stand. Only small quantities should be fed at the start to lessen the risk of bloat. With its high protein content, it is a great milk producer and very valuable for sows rearing a litter.

Value of Silage

Even the best intentions translated into the most careful plans are sometimes frustrated, and a dry spring and summer may result in a comparative failure of crops. In such seasons a reserve of silage carried over from year to year justifies its owner's foresight, for well-made silage is good summer feed for milk production and more valuable than hay because of its succulence. The allowance for young stock should be up to 20lb. daily, and for dairy cows 30 to 40lb. daily.

Increases in Prices of White Oats and Malting Barley

AN increase of 3d. per bushel in the ceiling price of white oats sold by growers during the 1947-48 season has been announced. The increase will make the new price per bushel 4s. 3d. free on rail, sacks extra, The price of certain specified varieties of malting barley is to be increased to 5s. 9d. per bushel, but the basic price for inferior varieties is to be 5s. 6d. per bushel.

North Island growers of feed barley are to be allowed a price differential of 1s. per bushel, making a bushel price of 6s. 6d. for the 1947-48 season.

CORRECTION: "FARMING IN NEW ZEALAND"

In the article "Farming in New Zealand: Meat, Wool, and Dairy Produce" in the August issue of the "Journal" the last line of Table III on page 171 should read:

(1945	.. ..	12.4	19.1	4.0)

and the last four lines of the first paragraph on page 173 should read: " . . . in the 1921-45 period, though sown grass increased by only 1.3 million acres, total sheep increased by 6.3 million and total cattle by 1.5 million."

TOMATOES INJURED BY HORMONE WEEDKILLERS

Other Cultivated Plants Susceptible

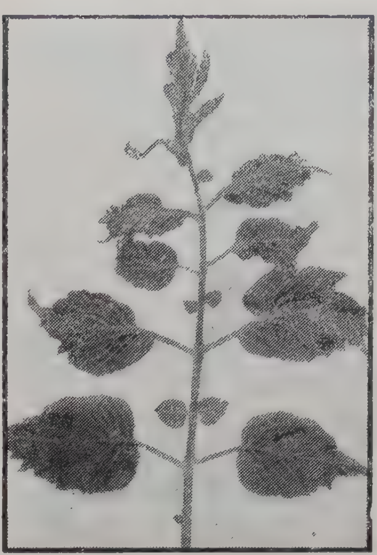
By J. D. ATKINSON, *Plant Physiologist, Plant Diseases Division, Department of Scientific and Industrial Research.*

AMONG new hormone weedkillers developed during the recent war is a substance known commercially as 2.4D, which is not strictly one compound, but a group of materials. Some of these have reached the New Zealand market during the past two years, and have already demonstrated both their usefulness for checking certain weeds and their danger to tomatoes and other cultivated plants.

IN November, 1946, curious distorted foliage appeared throughout an early crop of tomatoes in a heated glasshouse near Hastings. Although symptoms on individual plants resembled those of cucumber mosaic, the widespread nature of the trouble and its uniform onset were not consistent with characteristics of this virus. Inoculation tests showed that the disease was not cucumber mosaic. It was suspected that traces of a weedkiller containing 2.4D might have caused the damage, as similar injury had already been reported from England (Swarbrick, 1944). Tests carried out under glass in Auckland showed that traces of this weedkiller produced symptoms on tomatoes identical with those found at Hastings. During the summer of 1946-47 other specimens showing similar injury were sent in from five widely-separated localities in the North Island and two in the South. In each case it was found that hormone weedkillers had caused the distortion.

Symptoms on Tomatoes

Symptoms of 2.4D injury on tomatoes are as follows:—When a spray of weedkilling strength (1:100) reaches a plant the main plant starts to droop within a few hours. Translucent spots develop on some leaflets, and these soon die. Brown necrotic blisters appear on the stem. Leaf stalks curl downward, while leaflet edges roll up. Twenty-four hours after treatment the plants are markedly twisted and beginning to wilt. Nine days later they are dead.



[*L. H. Wright photo.*

Fig. 2—Tomato leaves damaged by 2.4D.

At greater dilutions the effect of 2.4D is less drastic. With a dosage of 1:100,000 the only symptom shown by fully-developed leaves is a slight drooping which disappears within a few days. Stem tips start to twist spirally soon after the spray reaches them. Growth does not stop, but a permanent bend forms at this point. New foliage developing after treatment shows a pronounced narrowing of the leaflets, which are often less than a third normal width, though only slightly reduced in length. Enlarged leaf veins stand out prominently against the darker green of affected foliage, being made still more conspicuous by the fact that they often run parallel to the midrib. Thin, misshapen lobes are usually present along leaf edges and the end of the leaf becomes a long twisted point (Fig. 2). At this dosage narrow foliage is produced throughout the remaining life of the plant. If fruit forms, it is generally elongated, beaked, and seedless, and may have internal cavities (Fig. 5). The whole plant appears spindly and unthrifty and is useless commercially.

Where only a trace of 2.4D reaches tomato plants the immediate reaction is a slight twisting of the main stem and drooping of some leaves. These effects soon disappear, but typical narrowing and distortion appears in the next two or three leaves formed. If the dosage has been very low (1:1,000,000 or less), later leaves may develop normally, while some normal fruit may form on the upper trusses.

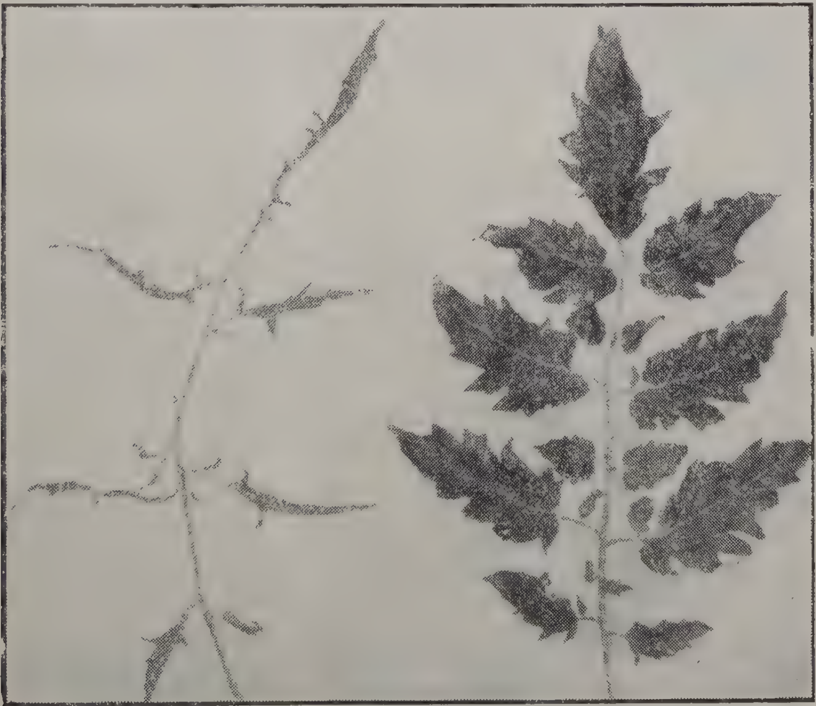


Fig. 1—Tomato leaf on left shows severe symptoms of cucumber mosaic; that on the right is healthy.

Identification

Malformations of the type described closely resemble those produced in tomatoes by cucumber mosaic. There

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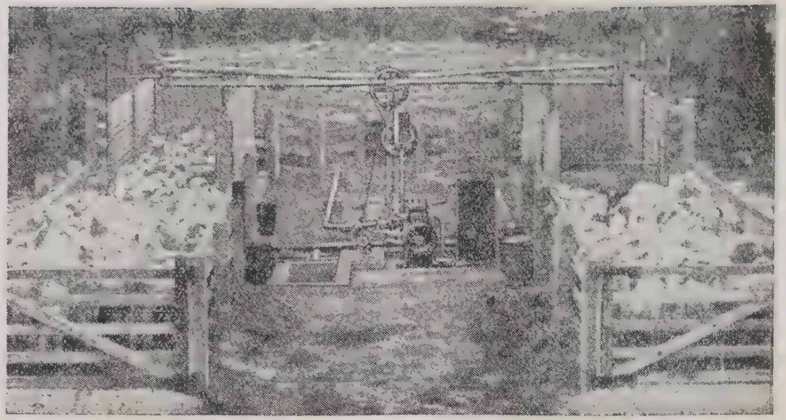

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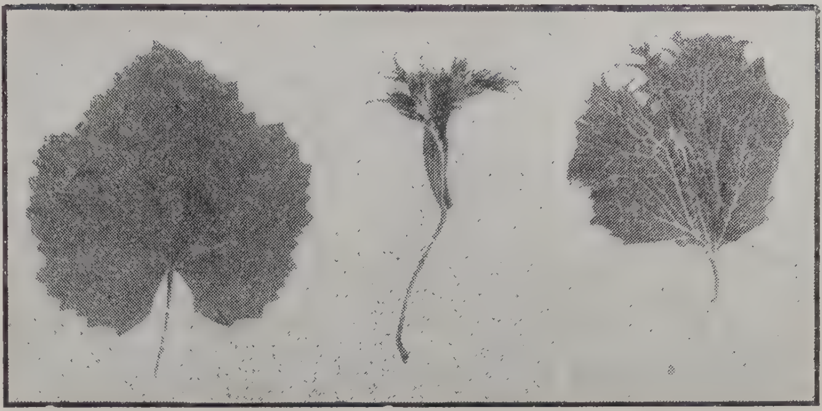
are, however, certain differences. Where virus is the cause leaflet lobes are long, thin, and pointed; leaf veins are relatively normal in appearance and any fruit formed is small and flattened (Fig. 1). Taken individually these differences may not be conclusive, but the manner in which trouble appears in the field usually provides clear evidence of the cause. Infection with cucumber mosaic appears first in odd plants, spreading from these during a considerable period; where 2.4D is involved a large number of plants show symptoms at the same time, usually 10 to 14 days after contamination.



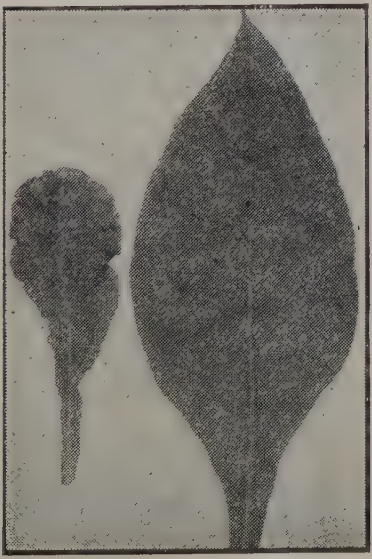
[*L. H. Wright photo.*

Fig. 4—Grape leaves showing effect of 2.4D, compared with a healthy leaf on the left.

Accidental Injury in Field

Where 2.4D is used as a weedkiller it may accidentally reach tomato plants in three ways—as residue in spray pumps, as spray drift, or as vapour from treated weeds adjacent to a crop. The first of these is the most common cause of trouble.

In some preparations the active agent is dissolved in oil. For normal weedkilling this is emulsified with water and applied through a spray pump. Oily residues are extremely difficult to remove from spray equipment and no ordinary method of washing will completely eliminate them. When some other spray is applied through the same pump there is enough 2.4D left to damage a large number of tomato plants. Rinsing with hot or cold water is almost useless and one thorough washing with kerosene does not remove all traces. Various attempts, made both here and abroad, to find some practical way of cleaning contaminated equipment have been unsuccessful.



[*L. H. Wright photo.*

Fig. 3—Effect of traces of 2.4D on a young tobacco leaf. Healthy leaf on right is the same age as the damaged leaf.

Whenever 2.4D is applied to weeds spray drift may cause injury to cultivated plants in the vicinity. This has occurred to tomatoes and the results are severe.

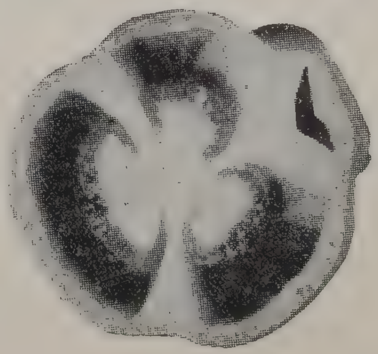
Some of the materials in this group are volatile and vapour given off by them produces typical injury on tomatoes. Staten (1946) has shown that vapour will cause injury on cotton plants 30ft. away from a dish containing a volatile solution. No figures are available for the distance at which this vapour damages tomato plants in the open. Under glass it has been found that vapour from plants sprayed with a trace of 2.4D will cause distortion in tomato plants ft. away.

Injury to Other Cultivated Plants

Officers of the Department of Agriculture have observed various forms of injury produced by 2.4D on cabbage, cauliflower, brussels sprouts, radishes, silver beet, swedes, turnips, onions, leeks, carrots, and beans. They have also noted damage on many flowering plants and shrubs, one striking case being malformation produced on grape leaves (Fig. 4). In glasshouse tests with tobacco it was found that traces of weedkiller caused puckering and stunting of young leaves, and malformation of four to five leaves developed after application (Fig. 3).

Prevention of Injury

Weedkillers containing 2.4D have been found useful in checking some troublesome weeds such as Californian thistle and convolvulus (Greenwood and Doak, 1946). As a result they may become part of accepted agricultural and horticultural practice in this country. When used in pasture country there is little risk, but in cultivated areas great care must be taken to see that neither spray drift nor vapour reaches susceptible plants. Where tomatoes are to be sprayed, the only safe course at present is to have two pumps, one for weedkiller only, the other for all normal sprays. From the nature of these hormone weedkillers it is apparent that they will kill or injure many cultivated plants. To avoid serious loss they must be used even more carefully than well-known materials such as arsenic pentoxide or sodium chlorate.



[*L. H. Wright photo.*

Fig. 5—Seedless hollow tomato produced by plant treated with 2.4D.

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CROPS FOR FATTENING LAMBS ON GISBORNE FLATS

By **J. E. V. SIMPSON,** ***Officer in Charge, Manutuke Research Station.***

EXPERIENCE with lambs fattened on crops grown on the Manutuke Research Station, Gisborne, points to the superiority of thousand-headed kale over all other crops tried, at least in that district. In view of the large number of store lambs sold at the saleyards between January and April, and bought by farmers for fattening on grass or crops, the results of these cropping and fattening trials are given in this article.

AT the outset the crops were grown to obtain information about their carrying capacity during the period when facial eczema might develop and to find whether they would protect the lambs from this disease. Lambs were also required for facial eczema work from January to April, and it was necessary that they should not graze on pasture during that time until they were transferred to the experimental fields. That necessitated a rotation of crops capable of carrying a large number of lambs during those months.

As no clinical symptoms of facial eczema have developed in lambs grazing pasture at the station during the past three autumns, no data are available on the protective qualities of the crops grown, but some interesting information about their carrying capacity and fattening ability has been obtained. Despite dry conditions during the past three seasons crops have been good, indicating the high fertility of the Gisborne flats.

1944-45 Season

In November, 1944, the following crops were sown: ½ acre of Japanese millet, ½ acre of maize, 1 acre of rape (a sixth of Broad Leaf Essex I, a sixth of Broad Leaf Essex II, a third of giant rape, and a third of thousand-headed kale), 1 acre of turnips (half of purple top and half of Hardy Green Globe), and 1 acre of chou moellier. As the fencing was incomplete it was not possible to graze these areas until February 14, 1945, when groups of lambs were introduced on to each crop. The following table shows grazing obtained from each crop. (One grazing day is equivalent to 24 hours' grazing on the area for one lamb.)

Crop	Grazing days per acre
Millet	605
Rape	1200
Turnips	1765
Maize	312
Chou moellier	939

The chou moellier was not ready for grazing until May 1, which was far too late for the purpose for which it was intended, but gave some useful winter grazing. The third of an acre of thousand-headed kale was grazed in conjunction with the rape, so no separate figures are available.

1945-46 Season

In the spring of 1945 the following areas of crops were sown: 4 acres of Japanese millet, and 1 acre each of sweet yellow lupins, sweet blue lupins, chou moellier, thousand-headed kale, Hardy Green Globe turnips, and rape. The following table shows grazing obtained from each crop:—

Crop	Grazing days per acre
Millet	1628
Rape	1065
Turnips	1435
Lupins	280
Chou moellier	859
Kale	2274

The Japanese millet proved a very productive crop for the number of grazing days available, but from the live-weight gain this crop cannot be considered useful for lamb fattening.

The crop of sweet yellow and blue lupins was a failure, being affected with collar rot and mosaic, and very little grazing was available, as the figures indicate. The crops of rape, turnips, and thousand-headed kale were very good; the rape and turnips were not quite as good as in previous seasons, but in view of the drought conditions prevailing could be considered useful and valuable crops at the time they were available for grazing. The chou moellier was again ready late and provided useful winter feed.

1946-47 Season

In the spring of 1946 the following areas of crops were sown: 4 acres of Japanese millet, 1 acre of rape, 2 acres of turnips, and 3 acres of kale. The grazing of these crops began toward the end of January and continued throughout the autumn. The rape gave 1069 grazing days an acre in the autumn, turnips 2490 days, and thousand-headed kale 2025 days to May 21 and 616 from July 1 to 22.

As the Japanese millet was eaten mainly by the ewes, the grazing time cannot be compared with that for other crops. Though the crop is not considered suitable for fattening lambs, it maintained them in good store condition.

During the three seasons under review rape scald developed in the lambs on two occasions, resulting in delay in sending them into the works as fat and generally retarding their growth. This crop should not be grazed until it is mature—that is, until the leaves have turned purplish-blue. An average of 30 lambs has been carried on an acre of rape for 35 days.

Two kinds of turnips were grown, Mammoth Purple Top and Hardy Green Globe, giving a rotation of grazing, as the Purple Tops are earlier maturing. An average of 30 lambs has been carried on an acre of turnips for 80 days.

The grazing of the thousand-headed kale began on January 20, and, as it was divided into breaks, continuous grazing was obtained until May 21. An average of 16 lambs an acre was grazed for the 121 days. The crop was then spelled until July 1 and 30 lambs an acre were grazed for 21 days. In all, four grazings for hoggets were obtained from the kale from January 20 to July 21. Cattle and wethers then grazed the area to clean up the field before it was ploughed.

From results with thousand-headed kale grown at Manutuke there is no doubt that it is as good as, if not better than, rape and chou moellier. No scald has developed in lambs grazing kale, and so waiting for the crop to mature before being grazed, as with rape, is not necessary. One and a half times as much grazing has been available from thousand-headed kale as from rape during the same period.

Chou moellier is considered to be a winter feed, but in the Gisborne district thousand-headed kale, if not grazed later than the middle of May, gives nearly as much winter grazing as an equal area of chou moellier. Kale has the added advantage of providing in the autumn feed equal to a crop of rape.

The following figures show that the fattening qualities of thousand-headed kale are as good as those of turnips and rape:—

	Grazing period	Daily live-weight gain (lb.)	Dressed weight (lb.)
Rape	15/2/45-29/4/45	.5	35.0
Turnips	15/2/45-29/4/45	.5	37.8
Rape	8/2/46-16/4/46	.29	28.0
Turnips	8/2/46-27/3/46	.33	27.0
Kale	8/2/46-12/4/46	.35	29.5
Rape	10/2/47-24/3/47	.45	34.3
Turnips	20/1/47-24/3/47	.44	37.2
Kale	3/2/47- 3/3/47	.5	35.3
	20/1/47-24/3/47	.44	36.7

The district averages for lambs killed at the Gisborne Refrigeration Company's works during March, April, and May of the 1947 season were 32.43lb., 33.62lb., and 33.72lb. The weights of the lambs grazing the crops, particularly turnips and thousand-headed kale, show that it is possible to fatten lambs to weights above the district average. At the same time, thousand-headed kale would give an area of feed available as an insurance against facial eczema and there would be a reserve of good winter grazing for the critical period in July or early August.

Small Fruit Profits Depend on Clonal Races

THE profit or loss made by a small fruit grower depends to a very large extent on whether or not he has planted clonal stocks true to name. The importance of using clonal material with a proved capacity for yielding heavy, regular crops is explained in this article by J. P. Hudson, Horticulturist, Wellington.

WHEN plant breeders decide to raise a new variety of, say, peas they decide on the characters required in the new variety, select as parents two existing varieties one or other of which shows all the required characteristics, and then cross these two peas together. The seeds produced by this cross are sown and grow into plants which may or may not have the characters desired in the new variety; but this is only the beginning of the plant breeder's work, as peas saved from this first generation will, when sown, produce very variable offspring because the characters are not "fixed."

Starting from these variable offspring the plant breeder has to grow many generations of peas, patiently discarding those which do not measure up to his requirements, until he finally produces a generation of seed which all produce plants of the desired type and which "breed true"—that is, produce seeds which, in turn, all produce the new type plant and so on. The new type is now "fixed" and can be given a variety name and put on the market.

New varieties of some fruits **could** be produced in exactly the same way, by crossing two existing varieties, sowing the seeds, and growing on several generations until finally a "fixed" new variety is produced which could be grown from seed. There are, however, practical difficulties in doing this with fruits. Whereas a new generation of peas can be raised each year, it might take five years or more to raise a generation of raspberries from seed to the stage when their fruitfulness could be assessed, and it might take 25 years before an apple seedling could be fairly judged. To breed a "fixed" variety of raspberries that could be raised from seed might thus take a man's whole lifetime, while it would require a plant-breeding Methuselah to "fix" a variety of apples.

Vegetative Progagation Saves Years

Peas are annuals which must be raised afresh each year from seed. Fortunately for the plant breeder, fruit bushes and trees are perennials, and there is an easy solution to this problem. New bushes and trees can be raised **vegetatively** by cuttings, suckers, layers, runners, budding or grafting, etc., without the necessity of using seeds at all, and there is therefore no need for a variety of fruit to be "fixed" before it can be put into commerce. This saves a great deal of time, as a breeder can introduce a new variety of fruit as soon as he has grown it for long enough to make sure that it bears heavy, regular crops of a desirable type of fruit.

How New Varieties are Introduced

The history of a new variety of small fruit, such as a black currant, may be traced as follows: First a breeder raises a number of seedling plants and grows them for some years, discarding each year those which fail to measure up to his specifications. Finally, after some years, he decides that one of the bushes shows very great promise, with desirable habits of growth and, above all, bearing heavy crops of good fruit each year. At this point the raiser will probably take a number of cuttings from this bush, root them, and grow some of the plants as fruiting bushes to confirm the impression created by the original bush. Others of the rooted cuttings will probably be planted as stock plants, all the new shoots of which are cut off each winter to serve as cuttings, which means, of course, that these particular bushes do not bear fruit.

By this means a large stock of plants of the new variety can be built up in the course of a few years, every single plant a direct descendant, by vegetative propagation, from the original one. This is called a clonal race and each named variety of small fruits (and tree fruits) should be a clonal race.

It is nearly 30 years since Lloyd George raspberry was introduced, and it is 117 years since the Cox's Orange Pippin apple was raised from a pip by Mr. Richard Cox, a retired brewer of Colnbrook in Britain. Millions of plants of each of these varieties have been raised and sold, yet every true Lloyd George plant in the world is a clone of the original chance seedling found growing in a wood in Dorsetshire, and every Cox's Orange Pippin apple is a clone of the original seedling.

Plants in clonal races are normally all exactly uniform in **potential** characters. Lloyd George raspberry canes, for example, would naturally grow and crop better in a fertile loam than in a poor, sandy soil, but this difference is due to cultural factors, and if suckers from widely-varying plantations were planted side by side in the same soil, they would both produce equally good plants and crops provided they were both true clonal Lloyd George.

"Bud Sports" Cause Variations

This uniformity is occasionally broken down by the appearance of "bud sports," in which a part of a plant suddenly develops some new character, as often happens, for instance, in chrysanthemums. One plant may develop flowers of some colour quite abnormal for the particular variety and a new clonal race can then be propagated vegetatively from this plant if it is desirable to do so.

Bud sports occur too in small fruits, and many of them are hard to distinguish from true clonal plants, yet they may be of a much inferior type yielding lighter, less regular crops. The unwitting propagation of these sports results in the variety becoming mixed, no longer a true clonal race, and much less profitable to cultivate than the original variety.

Although bud sporting may account for some of the present lack of uniformity in small fruit varieties, a much more common source of impurity is from seedlings which have inadvertently been allowed to grow and have become mixed with the stock. This happens very often in raspberries and strawberries, occasionally in black currants, and less commonly in gooseberries and red currants, as will be shown in the following consideration of each of these fruits separately.

Rogue Varieties in Black Currants

The choice of variety is one of the keys to successful black currant culture, just as it is in the case of the other small fruits, but there is much less likelihood of black currant seedlings becoming mixed with the true stock than in raspberry plantations.

Black currants are propagated from cuttings on which the bottom buds are left to encourage suckers to grow from below the ground. There is always a possibility of seedlings growing in the base of the bush being accepted by the grower as true suckers and left to grow, and cuttings taken from these shoots will, of course, produce bushes of rogue types which may be quite worthless from a fruiting point of view.

There are other ways too, including bud sporting, in which black currant bushes may revert to rogue types. These often remain vigorous and make much strong new growth which promises to crop well but never lives up to its promise, bearing instead only a few small, scattered berries. Yet in the winter when he cannot gauge their cropping capacity a grower may well be tempted to take cuttings from these fine, sturdy plants and thus propagate still more worthless currant bushes.

The test of a black currant variety should be whether every bush bears heavy crops of fruit each year. The general appearance of bushes may have remarkably little connection with their cropping capacity, which can be ascertained only by actually weighing or measuring the fruit picked from them over a period of years.

Rogue Stocks Yield Few Fruit

Some years ago a collection of black currant varieties from commercial plantations was got together for trial at the East Malling Research Station in England. The results of these trials were most illuminating. For instance, in one year the average weights of fruit picked from five-year-old bushes planted in blocks of 10 bushes each were:—

Baldwin (true type)	64oz. per bush
Baldwin (rogue type A)	7oz. per bush
Baldwin (rogue type B)	4oz. per bush

Yet all these stocks had been sent to the research station as reliable black currants of the Baldwin variety!

It seems that the time is ripe for trials of this sort to be carried out in New Zealand on a national scale, and it is planned shortly to undertake this work.

Meanwhile black currant growers who propose to raise cuttings next winter should very closely examine their bushes during this fruiting season and mark the heaviest-yielding bushes in which every individual branch is bearing a full load of fruit. By taking cuttings from the marked bushes the grower will at least know that he is propagating from the very best material available.

When young black currant bushes are planted out they should be pruned hard as described in the June issue of the "Journal." The prunings are often used as cuttings and this does offer a method of rapidly building up a stock. There is, however, considerable risk in propagating thus from young bushes which have not yet proved their fruitfulness, unless it is certain that the young bushes themselves were true to name and from heavy-yielding plants—that is, true clonal pedigree stock.

Failure of a new plantation to produce paying crops of fruit may be put down for several seasons to bad weather, late frosts, lack of insects for pollination, disease, and a variety of other reasons. Meanwhile cuttings are often being taken from these bushes year by year.

Even though these factors may be contributing to the failures, there is only one proof that the bushes are capable of bearing heavy regular crops, and that is for them to do so for a number of seasons, and cuttings should not normally be taken from black currants until they have proved themselves in this way.

Moreover if some or all of the bushes in a black currant plantation prove consistently poor croppers, a grower should not hesitate to scrap all young bushes he has at any time propagated from them, since they are likely to be equally unfruitful.

If every named variety of black currant is to be a clone—as it should be —very close attention must be given to every detail of propagation work to avoid any possibility of mixing varieties or propagating from non-clonal material. This involves, among other things, ability on the part of the propagator to recognize the main varieties from the appearance of their winter shoots. There is a need for an identification key to the common New Zealand varieties similar to the keys which have been worked out for varieties overseas.

Loganberry not a Clone

The loganberry is a variety of fruit, just as the Lloyd George is a variety of raspberry, the only difference being that the parents of the loganberry were dissimilar fruits (said to be the Auginbaugh, a form of Californian wild blackberry, and a variety of red raspberry similar to Red Antwerp), whereas the Lloyd George is presumed to be the offspring of two other varieties of true raspberry.

As a **variety**, therefore, the loganberry should be a clone, and every loganberry plant in the world should have a pedigree tracing back **by vegetative propagation only** to the original plant selected by Judge Logan in California in 1881.

Unfortunately this is not the case, as a number of so-called "loganberries" were raised from loganberry seed soon after the plant was introduced to commerce, and of course the seedlings were far from uniform. It is by no means certain that the true loganberry is grown at all in New Zealand, and there is good reason to suppose that some of the strains grown here are more fruitful than others.

Growers who propagate loganberries should make sure that layers are taken only from the best types of plants of known heavy, regular yielding capacity, and avoid propagating from any plants with a mediocre record of fruiting.

The clonal status of other types of small fruits will be dealt with in later articles. Growers who are interested in the technical aspect of plant breeding are strongly recommended to procure "Practical Plant Breeding," by W. J. C. Lawrence, published by Allen and Unwin at about 9s. This book gives a clear picture of this rather complicated subject.

SHEEP SHEARING TRAINING SCHEME

To overcome the present shortage of sheep shearers the National Service Department in conjunction with committees formed by sheep farmers in shearing districts is conducting a national scheme to give thorough training in shearing to learners. The scheme is being subsidised by the New Zealand Wool Board, which as a trial is making a grant of up to £1800 to finance the scheme in its first year.

Trainees are given three weeks' instruction during which they receive a subsidised weekly wage of £5 13s. plus keep or an additional payment of £1 15s. a week in lieu of keep. Applicants for training are given the choice of training in either blade or machine shearing.

Any farmer desiring to train learners is asked to agree to the following conditions:—

1. To take a learner into his shed during shearing and arrange for the learner to have three weeks' tuition by an experienced shearer.

2. To pay the learner a weekly wage of £5 13s. plus keep during the three weeks' course.

3. When the three weeks' course has expired, and provided shearing is still in progress, to continue paying the weekly wage (or 3s. 1d. an hour) until the learner is able to make a tally of £5 13s. a week.

4. To provide the learner with an efficient hand-piece or shears free of cost while he is in the services of the farmer or contractor.

5. To accept and insure against statutory liability for accident.

Farmers will not be permitted to engage their own sons as subsidised trainees under the scheme. The placement of trainees with near relatives is approved only if the local shearing committee is satisfied that the trainees will continue in full-time shearing during the rest of the season.

Farmers or contractors who engage approved learners through a district officer of the Department of Labour and Employment and who agree to the above conditions will be entitled to claim a weekly subsidy of £3 for each learner. Where trainees absent themselves from work the subsidy will be reduced proportionately. The farmer is to pay £1 a week to the instructor for each learner under the charge of the instructor. No subsidies will be approved for learners engaged by shearing contractors, to which the award provision regarding learners applies.

◆

Prizewinner Yellow Globe mangolds, crowded two rows into one, being loaded on to a dray at Belfast, Canterbury, before being pitted. Six pounds of seed an acre was sown in 24in. ridges.

MANGOLDS

By J. E. DAVIES, *Instructor in Agriculture, Hamilton.*

GIVEN suitable growing conditions mangolds are the highest yielding and most reliable of all root crops, producing a greater number of food units of longer keeping quality than other crops of its class. The mangold crop is practically immune from disease and insect attack, enabling it to be grown on the same land for several successive seasons.

MANGOLDS (*Beta vulgaris*) were introduced into English agriculture about 1800 and have been successfully grown throughout New Zealand. In the early stages of land development and before the era of intensified grassland farming the acreage grown in mangolds was considerable, the crop being depended on to play a key role in the supply of supplementary stock feed for winter and spring.

Acreage Declining

With the impetus of more intensified all-grass farming, accentuated by labour difficulties, the Dominion acreage of mangolds has progressively declined, decreasing in the past few years by about 1000 acres annually. Within the past decade the acreage grown has diminished by more than half. The mangold crop, however, is not an exception in this respect, as practically all other root crops have shown a marked decline in cropping acreages. Mangold distribution within the Dominion and the declining trend of the acreage grown are shown in the following table:—

ACREAGE IN MANGOLDS

Land District	1925	1930	1935	1940	1944
North Auckland ..	726	176	212	183	66
Auckland	2,641	979	523	1,358	126
Gisborne	139	141	232	105	37
Hawke's Bay	359	407	630	543	263
Taranaki	2,225	1,547	1,205	309	121
Wellington	2,649	2,643	3,424	2,202	957
Nelson	38	21	75	61	24
Marlborough	310	150	141	46	20
Westland	31	1	—	1	—
Canterbury	3,927	2,859	3,375	3,099	1,870
Otago	2,036	1,556	1,359	1,580	973
Southland	30	39	35	123	193
Totals	15,111	10,519	11,211	9,610	4,650

As is to be expected, the decrease is most noticeable in the intensified dairying districts, not so much because fewer farms are growing mangolds, but rather because of a reduction in the size of individual areas, many of which are only an acre or less in extent. The reduced acreage has resulted in higher-yielding and better-quality crops, so production has not fallen as greatly as the decrease in area would indicate.

Economic Importance

Though the acreage grown appears comparatively small, mangolds still fulfil an important economic role, being grown principally for dairy cows, in-lamb and mothering ewes, and as a basic ration for wintering store pigs.

The mangold is a high yielder of food units, unique for long-keeping qualities, a reliable crop to grow, and practically disease free and drought resistant. In view of their excellence as a winter forage crop, more mangolds should be grown in New Zealand.

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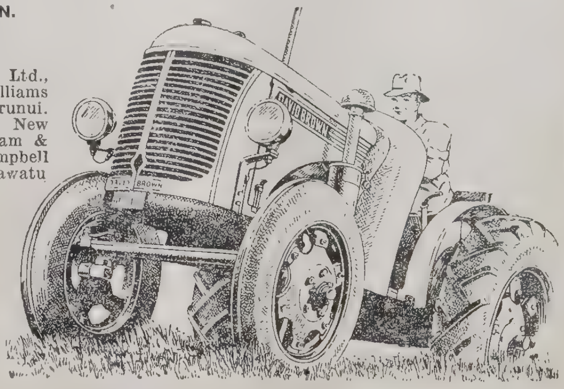

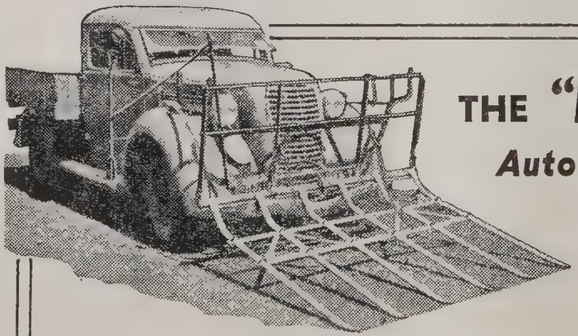

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Soil and Climate

Mangolds grow best on deep, fertile, well-drained loams, though good crops can be grown under a wide range of soil conditions if adequate fertiliser and suitable varieties are used. The mangold is a sun-loving plant requiring a sunny aspect and a moderate climate. Once established it withstands a drought better than other root crops. Most crops, particularly root crops, require reasonably dry conditions of soil, and mangolds are no exception.

Small areas, well managed, using farmyard and artificial manure efficiently, are preferable to larger areas, for which the provision of adequate cultivation for the suppression of weed growth is difficult.

Varieties

Under normal conditions numerous varieties are offered to growers, and they are commonly classified into four main groups according to their shape and colour: —

Long or semi-long: Most common in this class are Long Red, Sugar, and Jersey Queen varieties, which have more length than breadth and usually grow roots half to two-thirds above ground. The ratio of length to breadth is 3 or 4 to 1. The skin colour is red, yellow, or greenish white. They are heavy yielders and suited to the more fertile soils.

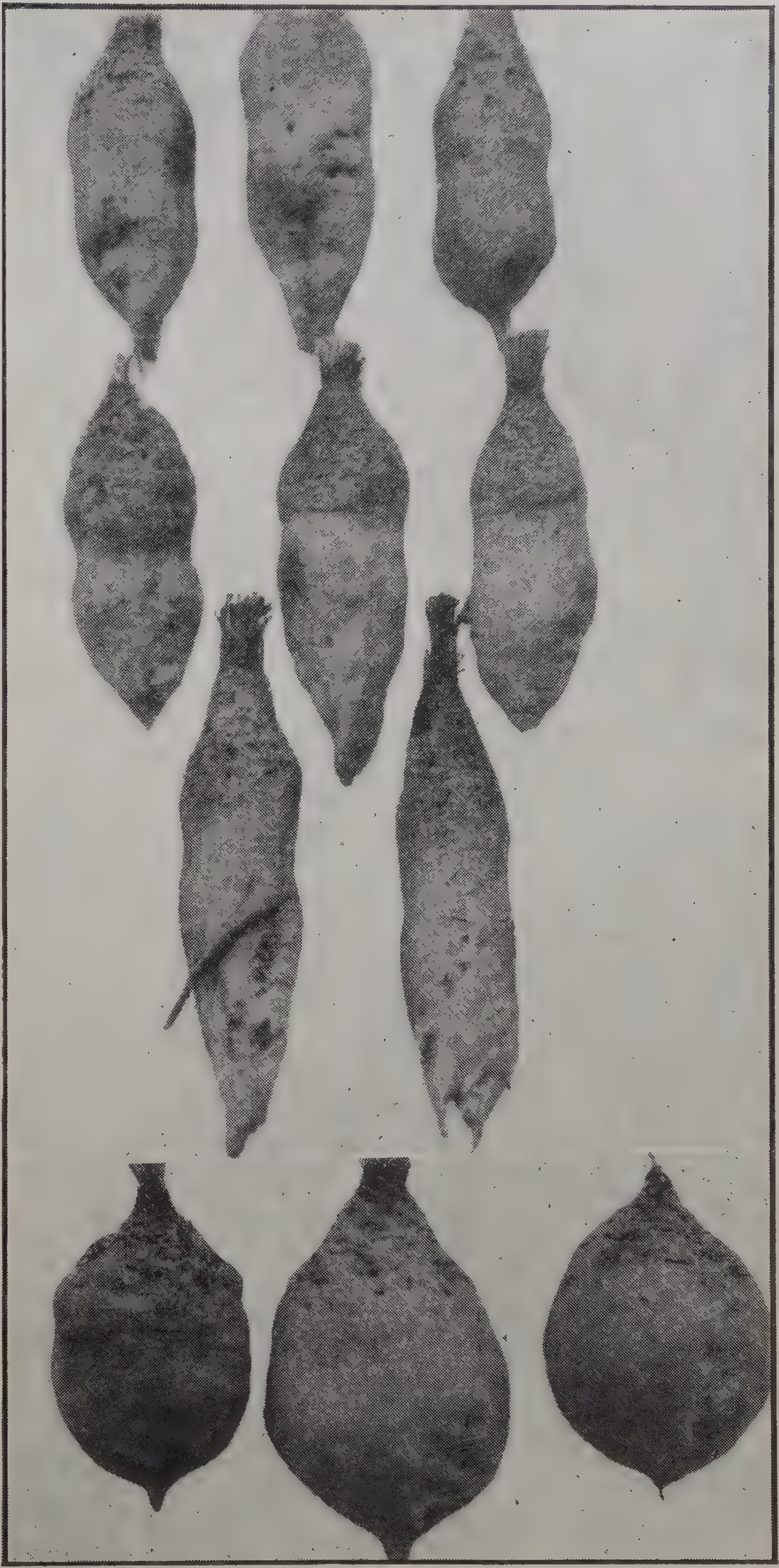
Intermediate: The main varieties in this class are Red and Yellow Intermediates, which are more oval and regular in shape than the longs, with a length: breadth ratio of 2 or 3 to 1. The skin colour is red, yellow, or orange. They succeed over a wider range of soil types than other varieties.

Tankard: The best known varieties are Golden and Yellow Tankard. The roots are smaller, somewhat cylindrical in shape, with straight sides and a length: breadth ratio of 2½ to 1. The skin colour is red, yellow, or orange. They produce lighter yields but are high in feed value. This variety can be grown over a wide range of soil and climatic conditions.

Globe: This class includes the varieties most commonly grown — Prize Winner Yellow, Yellow, Orange, and Lemon Globes. In shape they are somewhat spherical. They grow well above ground and are easy to lift. The length: breadth ratio is 1½ to 1 and the skin colour yellow to golden. The globes are high yielders and adaptable to a wide range of soil and climatic conditions.

The variety to sow is determined by soil and climatic conditions, and local experience should be considered. In general, the two most popular varieties grown are Prize Winner Yellow Globe and Long Red. The Long Reds thrive

MANGOLD VARIETIES



From top—Tankard, Red Intermediate, Long Red, and Yellow Globe.

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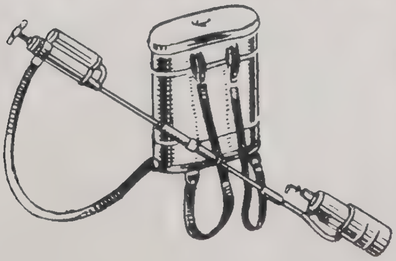

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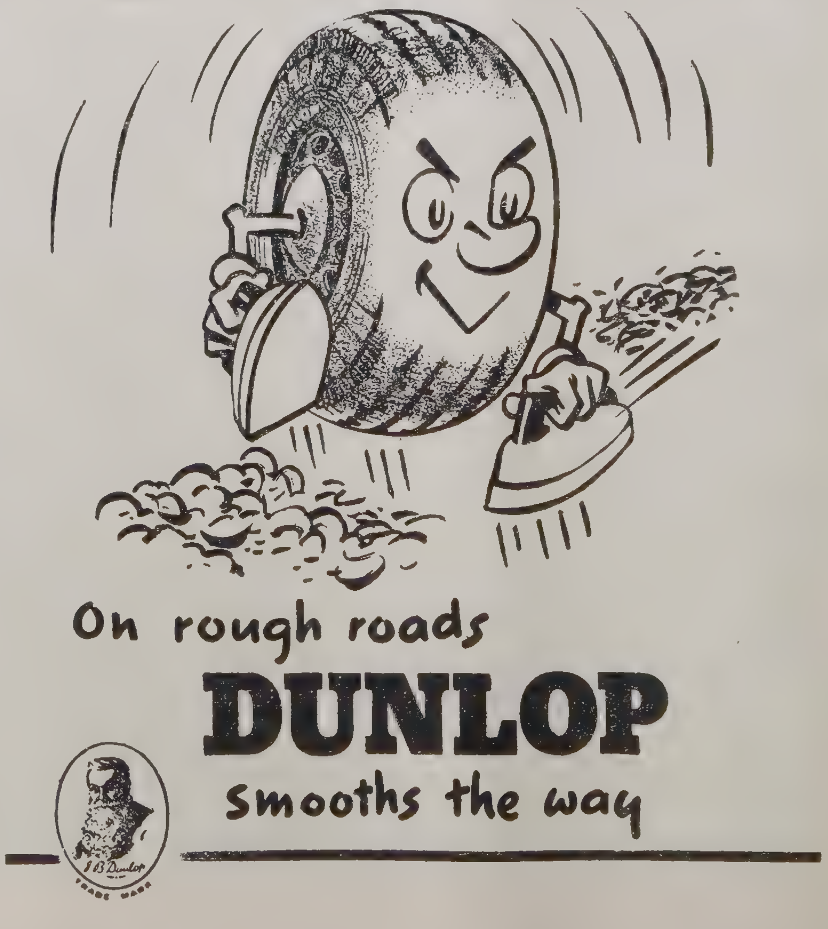
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best on moist, deep, fertile soils, whereas the globes will outyield all other varieties on medium or light fertile land and are particularly suited to drier climates. Their relatively-small leaf growth allows for closer rows and plant spacing, making the variety more suited to intensive cultivation, thus promoting heavier yields. The selection of a good variety enhances the grower's chances of securing a reliable crop.

Place in Rotation

Mangolds are generally sown on land of high fertility, and usually they follow grass rather than cropped land where fertility has been lowered. Given adequate early cultivation to allow turf decay, the large amount of vegetable matter stored in a grassland lea provides an excellent soil medium for the crops.

At times the mangold has been profitably grown on the same land for several consecutive seasons. Often the second and subsequent crops outyield the first because cultivation for the preceding crop breaks down organic matter and keeps the land weed free.

In a programme of pasture renewal mangolds are considered a most profitable between-crop, providing the ideal land preparation for regrassing.

Whatever cropping rotation is practised, mangolds may be conveniently included if reasonable fertility standards are maintained.

Land Preparation

As mangolds are grown on a diversity of soil types and in varying climates, no set rules for cultivation can be laid down. On adjacent farms, or even adjacent paddocks, methods of cultivation differ considerably. Soil type, weather, weed prevalence, and availability of labour and implements are all factors in varying the degree of cultivation employed to produce the required seed-bed.

Mangolds are deep rooting, so deep ploughing is the first essential. If they follow grass, the land should be ploughed sufficiently early to allow time for the turf to decay, so that with the following cultivation it may become thoroughly incorporated with the soil.

In the South Island the preparation for the crop begins in the autumn, usually with skim ploughing the area followed by working the skimming, and then by deep ploughing in June. On the heavier and damper soils the crop is very often sown on the one furrow, this being deep ploughed in June or July.

In the North Island, particularly on the lighter, free-working, loam soils, ploughing may be deferred until August or after. In some instances the land is skim ploughed, well disced, later deeply cross-ploughed, and eventually intermittently cultivated to the desired tilth. More often the land is only deep ploughed, furrow rolled, then repeatedly cross-disced, harrowed, and rolled until the requisite deep, mellow tilth and firm seed-bed are secured.

Land to be planted in mangolds should be cultivated early and thoroughly.

Seed Production

Until recent years nearly all mangold seed was imported and a choice of many varieties was offered. Shortage of overseas supplies during the war necessitated the production of the country's seed requirements in New Zealand.

For seed production, roots may be lifted in the autumn, sorted during the winter, and replanted in the spring. This method is expensive but is suitable for small areas and enables a root selection to be made. An alternative method is to sow seed about February in 7 or 14in. drills at about 12lb. an acre, and either allow the plants to seed where they are or transplant the "sticklings" in the early spring. This method does not permit of bulb selection but is more economical when larger areas are involved. Provided proper care has been taken in the selection of the seed, the direct sowing or "stickling" methods are to be preferred to the bulb planting method for commercial areas. Care should be taken to allow the seed to ripen as far as possible before harvesting, as that ensures better germination in the seed, but if the crop is left too late, severe losses by shedding of seed may result.

Mangolds and other members of the beet family, such as sugar beet and the common garden beet, cross-fertilise, so it is imperative to ensure that the intended seeding area is a considerable distance from other members of the beet family.

Sulphuric Acid Treatment

The seed of the mangold is really a multiple fruit or capsule containing two to four real seeds. Germination percentages are based on the number of germinating capsules, the average being about 70 per cent. Because of the hard capsule, germination is slow and requires considerable soil moisture. The germination of seed to be sown during protracted dry spring weather and in dry soil can be greatly assisted by treating the seed with sulphuric acid. That ensures a more even strike, and the advanced field germination is vital in competing against weed growth. The treatment is as follows:—

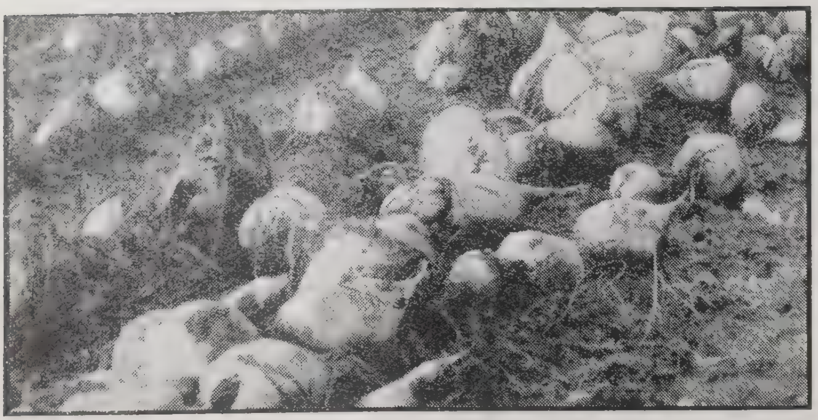
Sulphuric acid of a specific gravity of 1.72 is used in sufficient quantity to wet the seed thoroughly. Normal sulphuric acid has a specific gravity of 1.84 and, to reduce this to 1.72, 6¼ parts by volume of normal acid must be added to one part by volume of water. The acid must be added to the water, not the water to the acid. About 1lb. of acid is required for each 1lb. of seed. Wooden or enamel vessels should be used. Soak the seed for 10 minutes and allow it to drain for 15 minutes. Wash it thoroughly for 30 minutes in running water, and then for a further 15 minutes in three changes of water to which ground limestone has been added—a handful of lime to 4 gallons of water.

The sulphuric acid eats away the outer hard coat of the seed so that moisture in the soil penetrates the seed much more readily and germination is hastened.

Sowing

The crop is usually sown during October and November at from 4 to 6lb. an acre, depending on row width and soil conditions, the seed being covered about ¾in. deep. Small areas may be dibbled in by hand or drilled in with a hand seeder. Field crops are usually sown either by a combined ridger and sower (more particularly on heavy soils) or with an ordinary grain drill on the flat (using the mangold plates in the turnip box).

With the ridged method the rows are well defined, allowing mechanical



Lifted Orange Globe mangolds, crowded four rows into one, before being carted in.

inter-hoeing for weed control even before the plants appear in the row. Furthermore, during early inter-hoeing the soil is brought to the hollowed centre away from the young mangold plants, thus avoiding soil smothering. On certain soil types it is an advantage to roll the ridges immediately after sowing, particularly if the seed-bed is dry, as that assists to promote surface moisture and aid germination.

Sowing on the flat is recommended on light, clean land, and the flatter the land surface the greater will be its ability to resist drought. The chief drawback of the flat method is that the crop cannot be mechanically interhoed until the plants are visible in the rows, and should germination be retarded and the land weedy the young plants are suppressed or choked out before establishment takes place.

The distance between rows varies from 14 to 28in. depending on soil conditions and the variety. The advantage of narrow rows is that a larger number of moderate roots can be grown, giving a higher yield an acre. However, row width depends largely on the space required for adequate inter-hoeing without damage to the crop. Experience has shown that rows 21in. apart on heavy soils give the best yields.

Manuring

Because of its productive capacity, the mangold crop responds to liberal manuring. On small areas waste silage or well-rotted animal manure may be spread and ploughed in during land preparation, greatly enhancing the prospect of a successful crop. Fertilisers are applied at seeding time, seed and fertiliser usually being sown in one operation. Phosphate is the essential constituent, though a complete fertiliser is often used. For mangolds grown after cereals, superphosphate or serpentine superphosphate, used alone or with equal quantities of blood and bone at from 4 to 5cwt. an acre, can be recommended.

Small areas intensely cultivated with heavy manurial dressing are preferable to larger areas indifferently cultivated and lightly manured.

Inter-cultivation and Thinning

Whatever emphasis has been placed on land preparation, sowing methods, and manuring, the importance of subsequent cultivation cannot be stressed too strongly. Inter-cultivation should be started as soon as weed growth appears or as soon as the mangold plants can be distinguished in the rows, and should be carried out as frequently as possible until it cannot be continued without damage to the mangold plant. If that is done all weeds will be killed when they are most vulnerable—in the seeding stage.

When plants are ready for thinning mechanical inter-cultivation should be done as closely to the plants as possible, and it is desirable that the final inter-cultivation given to the crop should provide a slight earth mould up to the mangold roots.

Thinning should be started as soon as the plants are large enough to separate easily, usually at the two- to three-leaf stage. If left too late, the operation becomes too costly, plants get a setback, and the yield is reduced. The work may be done by hand if the area is small or by hand hoe on larger areas.

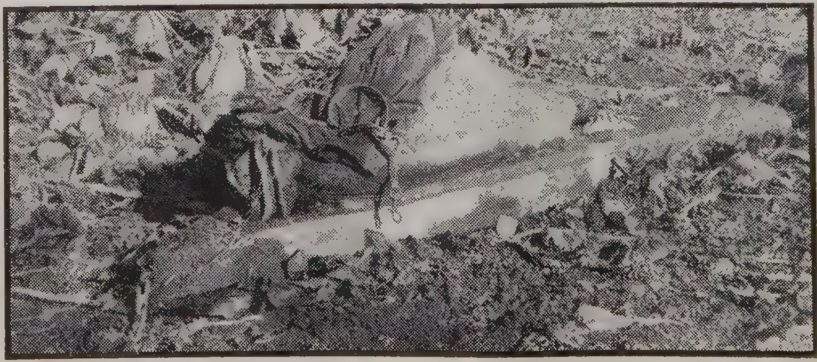
Thin the plants to 8 to 12in. apart, depending on the variety, wherever practicable leaving the most robust plants, at the same time destroying all the weeds in the row. Do not thin too widely, as the roots should be kept at a moderate size for highest dry matter yield. That is particularly important where the crop is grown to be processed for the confectionery trade, the aim then being for good quality small-sized roots. For this trade the larger-sized roots are picked out and sold about February, the smaller plants being allowed to remain to produce good-quality roots about June.

Transplanting

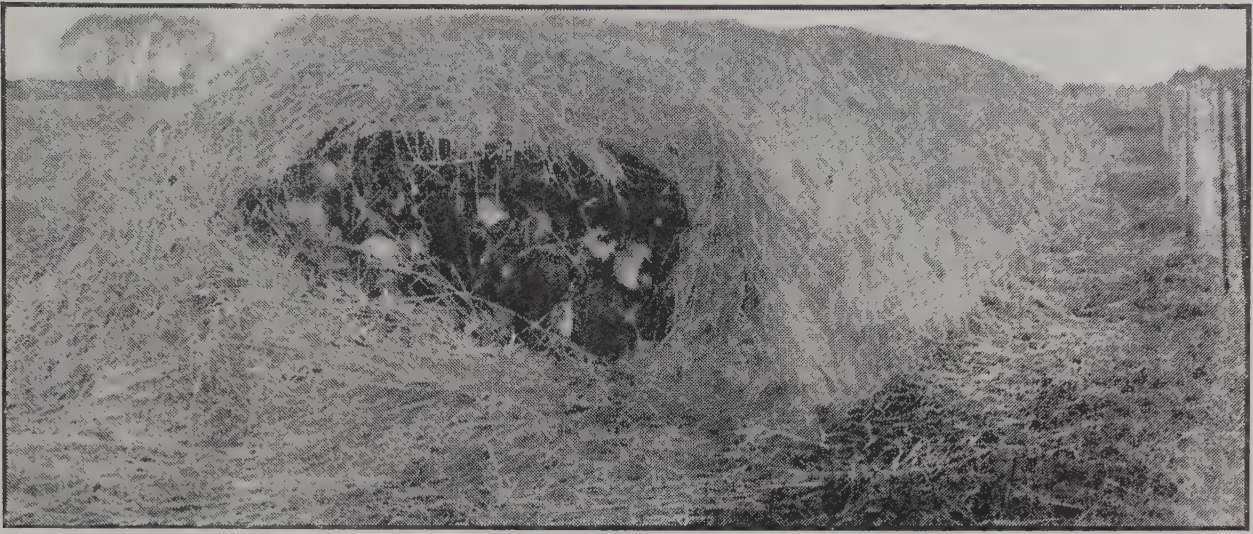
Mangolds transplant well if care is taken to choose favourable soil and climatic conditions. Good, big, forward plants with slight bulb formation should be used.

Where this method of growing is used in Auckland Province the seed is sown in beds during September and the plants transplanted into their permanent positions in December. At that stage the plants have bulbs about the size of a man's thumb. The mangolds are transplanted during ploughing, usually in every second furrow. They are pressed into the fall of the newly-turned furrow slice and covered by the next furrow slice, the operation continuing as the ploughing proceeds. The rows are about 20in. apart, and a crop transplanted in this manner requires little if any inter-cultivation. Transplanting may also be undertaken to fill up the blanks in a patchy crop.

After grass good results are obtained by ploughing in late winter, followed by a deep ploughing in November, the land being ploughed a third time as the mangolds are planted in December. With this method some precautions are necessary. Set the plants at about the same depth as they grew in the



A farm-built mangold crowder in the form of a triangular sledge, used to crowd two rows into one.



Orange Globe mangolds covered with wheat straw in a 40yd. pit.

nursery beds, and the ground round each plant should be firmed by the planter's feet after it has been covered by the freshly-turned furrow slice.

The advantages of transplanting over sowing and thinning are obvious. In addition it allows for closer spacing, leading to high-quality, medium-sized roots requiring no inter-cultivation. This method is not recommended where rainfall is low and likely to be unreliable at planting time.

Yield and Food Value

The mangold is renowned for its ability to produce a high yield of valuable fodder, and in New Zealand some phenomenal crops have been grown. Though they vary with variety, climate, and soil, yields of from 50 to 70 tons an acre may be considered good field crops.

The feed value depends on the dry matter content, and for total bulk no other root crop can compete against it. There is no relation between colour and feed value, and though varietal differences in yield and composition occur, on the average mangolds contain about 12 per cent. of dry matter, of which some two-thirds is sugar.

Mangolds are practically free from disease, though occasionally some leaf spot or mottling of the foliage may occur. The mottling is a virus disease known as mosaic, and aphides are the most active agents in its spread.

Harvesting and Storage

The mangold crop takes from eight to ten months to grow to maturity, being planted in October and available from June onward. Some farmers consider that before being fed to stock the crop should be lifted and allowed to ripen for at least two weeks or stock losses are likely to occur. Nevertheless, mangold may be fed off in the paddocks during the latter part of the season if they have reached maturity. Occasionally cases of mangold poisoning of pigs and cattle are reported. They are unpredictable and are caused by the plant developing a high concentration of potassium nitrate. The only precaution that can be taken is to ensure that immature or unripened mangolds are not fed out too freely to hungry animals. A gradual increase in the quantity fed over a week or so will minimise the risk.

The usual harvesting method is to allow the crop to reach maturity, then pull the mangolds, twist off the tops, throw the roots from three rows into one, and leave them to ripen on the ground for three to six weeks. If there is danger of frost, it is advisable to cover the roots with leaf tops, as freshly-pulled root tips are quickly blackened by frost.

Though the bulk of the crop is usually left to ripen in the field and then carted out directly to stock, a considerable portion is stored in heaps in the open or under trees to be used for late winter and spring feeding. Here again, where frost damage is likely the heap should be covered with a layer of straw to prevent frosting. Even when mangolds are pulled for storage it is advisable to allow for partial ripening in the field, as a wilted root will not bruise during cartage as readily as one recently pulled. Every care should be taken not to bruise or damage storage roots unduly or their keeping qualities are impaired.

Where roots are to be eaten early, chain harrows are sometimes used to lift the crop. Though that may cause some damage, the saving in time and labour may more than compensate for the loss.

Feeding to Stock

All stock eat mangolds readily. They are particularly favoured for dairy cows and in-lamb ewes because they provide a valuable food for the promotion of milk. For dairy cows begin with a ration of some 20lb., increasing it in combination with hay to a safe limit of from 40 to 50lb. daily. Mangolds are taint free. The crop can also be fed with advantage to fattening bullocks, for which the ration may be increased. Though providing an excellent sheep feed, they cannot be folded on and fed off like swedes; that drawback greatly limits their use as a sheep fodder. Mangolds are widely used in the feeding of stud flocks.

They are often carted out whole on to the pasture, but for sheep they are sometimes sliced with a root cutter. The cutter is attached to the dray at the level of the flooring, the roots being fed in and the sliced mangolds falling on to the pasture. The root cutter is driven from the dray axle.

As a pig feed mangolds are held to be most valuable, particularly in the wintering of stores. Because of their keeping qualities they provide food well into the spring and, with a small ration of meat meal, supply a food on which pigs will thrive, 10lb. of mangolds being equivalent to 1lb. of barley.

Mangolds play an important role as a quality crop in the cropping programme. They afford a palatable, wholesome, succulent, and nutritious forage for winter use, fully repaying the cost and labour involved.

FARM WORK FOR NOVEMBER

By the Fields Division.

SILAGE AND HAY

Silage-making will be in full swing throughout the month. Although there has been a decline in the amount of silage made in recent years, there are still many farmers who consider it an excellent method of conserving surplus growth for future use. Material for silage should not be allowed to wilt too long before being stacked. Cut in the one day only what can be stacked the same day or the next morning. If made at a temperature of 100 degrees F. 4 to 5ft. down in the centre of the stack, the silage will tend to be green and sour toward the centre, changing to a sweet silage of a brown colour toward the outside. As soon as building is completed stacks should be weighted with earth, which can be held in position with boards, wire netting, or bags of earth placed round the outside of the stack.

Haymaking is an important activity on both dairy and sheep farms. Cattle and sheep produce to their maximum in the spring only if they have been adequately fed during the winter and early spring, and adequate feeding then requires the use of ample stocks of good hay. Though the introduction in recent years of more modern haymaking machinery has tended to facilitate and make more popular the saving of hay, stock could be more successfully wintered if a much greater quantity of hay were made. Many of the most successful dairy farmers, for example, make a practice of conserving double (or more) the amount saved by many others whose results are only indifferent or average. On sheep farms, also, much more hay could be utilised with advantage. Many sheep are wintered on turnips, swedes, lupins, and other kinds of greenfeed, and the addition of adequate supplies of hay would provide them with a more balanced ration.

SUPPLEMENTARY FEED

On dairy farms mangolds should now be sown for winter feed and maize and millet for summer and autumn feed if the required acreages have not already been sown. Cattle pumpkins may also be sown now.

Rape required for fattening lambs as they are weaned should be sown in breaks throughout the month at the rate of 2½ to 3lb. of seed per acre on a fine seed-bed. Paddocks can be sown down to grass with the rape. It is usual to sow the grass and clover mixture down the coulters with the rape seed, but it may be sown broadcast. According to the practice most common to the district swedes may be sown with the ridger in 28in. rows and intercultivated, or the seed may be sown on the flat through every coulter of the grain drill. Chou moellier for next year's winter feed or for a seed crop should be sown now and the ground prepared for sowing turnips in December and January.

POTATOES

Complete planting of main-crop potatoes. Harrow crops recently planted to kill weed growth. Crops sufficiently forward should be intercultivated to kill weeds and to conserve moisture.

LUCERNE

Many farmers plan to sow new lucerne stands during November. Provided the land has received a good fallow, and it is free from one or other of the various twitches, lucerne can be sown now with advantage. At this time of the year the land is warm, and on a fine, well-cultivated seed-bed germination of the seed will be fairly rapid. Before sowing, periodical harrowing should be carried out to destroy any weed seeds which may have germinated. The periodical harrowing will also consolidate the seed-bed from the bottom upward, and this is preferable to consolidation by using the roller. In most districts lime should be applied at the rate of about 1 ton per acre at any convenient time before sowing the seed. Lucerne is a lime-loving plant and generally gives a marked response to adequate lime applications. Sowing of the seed should be carried out on a rolled surface. The seed may be sown broadcast, but in a district where the rainfall is uncertain it is preferable to drill the seed through every coulter at the rate of 12 to 14lb. per acre, or, if it is cross-drilled, at the rate of 8 to 9lb. of seed each way. Turnip coulters or worn grain coulters should be used to ensure shallow sowing. Seed should be inoculated just before drilling, and the culture for this purpose can be ordered through a mercantile firm. The safest fertiliser to use is equal quantities of superphosphate and lime mixed a few days before drilling. Mix the seed with the fertiliser, and drill through the manure box of the grain drill.

PREPARATION FOR WHEAT

Prepare ground for next season's wheat crop. Grassland not required for stock can be skim-ploughed now. This is particularly desirable where one or other of the various twitches is present. The twitch can be eradicated during the summer probably more effectively than at any other time of the year. Moreover the long fallow gives the turf ample opportunity to decay and thus become thoroughly incorporated throughout the soil once deep ploughing is undertaken.

IRRIGATION.

Land to be border-diked this summer for sowing down in the autumn should be deep ploughed, and then receive periodical cultivation to destroy weeds. Freedom from weeds when sowing down a field to pasture or lucerne can add many useful years to the life of the area. As border-diking by the grader proceeds the stiff-tined cultivator should follow immediately behind the grader to grub up each border.

As the season for watering usually commences this month, irrigation farmers should inspect their canvas dams, head-races, and head-gate boards for any defects. Where the boards have been put under cover for the winter they should be installed again in the irrigation paddocks. Large pasture areas should be subdivided so that rotational grazing may be practised. As soon as the ground temperature becomes warm and before the surface soil becomes too dry for optimum growth irrigation can commence. The time of the first irrigation for the season is governed largely by the weather conditions in the spring. Once watering commences it should be carried out regularly throughout the summer. A hay crop may be taken this month from the lucerne area, and as soon as the hay is off the paddock the field should be watered to boost the new growth coming away from the base of the plant.

GRASS AND CLOVER SEED PRODUCTION

Close areas for the production of perennial ryegrass, short-rotation ryegrass, and Italian ryegrass seed, and white clover seed. The quality of the land and the general vigour of the sward will largely determine the most opportune time to remove the stock. If closed too soon, excessive bulk may create harvesting difficulties. In addition, rank-growing crops of white clover do not set seed freely.

STOCK

All dry sheep should be shorn as soon as possible and kept grazing in a pasture of their own. In northern districts, where lambs are weaned and finished off on grass, they should be drenched regularly for parasites, and a watch should be kept for scald in wet areas. Where lambs are still running with the ewes the pastures should be kept fresh and clean by shifting the sheep at least twice a week.

THE HOME GARDEN IN NOVEMBER

By A. G. KENNELLY, *Instructor in Vegetable Culture, Christchurch.*

IN the well-planned garden there is much essential work to be done during November. Crops should be kept cultivated and free from weeds, seed should be sown for winter greens, root crops thinned, potatoes planted or earthed up, and in some districts peas and swedes can be sown. The sowing or planting of frost-tender subjects such as French or runner beans, cucumber, marrow, pumpkin and squash, tomato, and sweet corn can be proceeded with except in southern districts, where frost is still a danger until the second week in the month. The sowing for succession of spinach and of salad crops such as lettuce, radish, spring onions, and turnips, and the planting out of cabbage, cauliflower, and lettuce to mature in the late summer and autumn should be attended to.

STAKES or fences can now be provided for such crops as tomatoes and runner beans, and beds can be prepared for an early planting of celery. Liquid manure may be applied to most green crops.

Asparagus

It is important that asparagus beds should not be cut for too long each year. On new beds no spears should be taken from the first year's growth and from the second only two weeks' light cutting, with a week longer the third season. Thereafter crowns may be cut for seven or eight weeks each season. Whatever length the spears are allowed to grow above ground before harvesting, it is important that they should be cut before the bud begins to open. Cutting should be done carefully so that closely-adjoining buds are not injured. A cutter with a blade with a bevelled edge somewhat like a carpenter's chisel thrust into the spear with a slightly downward motion rarely injures adjoining buds.

Beans

Though runner or pole beans sown at the beginning of the season should continue to yield well until cut down by the frost, it is usually advisable to make two or three successive sowings of the dwarf or bush varieties. The pods of all varieties of beans should be picked as they approach maturity to ensure that production is continued for a maximum period.

Beans are easy to grow and can be so simply preserved that it is a good plan to grow more than is needed for immediate use and to preserve the excess, as during the winter they will provide a welcome change from the limited range of vegetables available. They can be easily preserved by salting. For each 2½lb. of beans allow 1lb. of salt (not iodised) and ½lb. of sugar. The beans should be cut as for the table and put in a large bowl, where the mixed sugar and salt should be sprinkled over and through them. By next day a brine will have formed and the beans can be packed with the brine in jars, each of which should have a dust cover and be stored in a cool place.

Beans should be sown 2in. deep and 3in. apart in well-drained soil that is moderately rich in humus. In good soil they are better thinned later to 6in. apart. The rows should be 2ft. apart for dwarfs and not less than 3ft. for runners. Superphosphate can be applied at the rate of 1lb. to 7 yards of row immediately after growth has commenced and hoed in. The substitution of sulphate of ammonia for 20 to 25 per cent. of the superphosphate has led to improvement in the quality of the beans on some soils. In some districts it will be necessary to sow disease-resistant varieties, several of which were mentioned in last month's "Journal."

Carrots and Beetroot

Successional sowings of carrot and beetroot should be attended to if necessary. In areas affected by the carrot rust fly the sowing of the main carrot crop can be deferred until January, but in most districts the main crop can be sown now, though some growers prefer to delay until December, when the carrot aphis is often less troublesome. Sow ½in. deep in rows 12 to 15in. apart. If the soil is inclined

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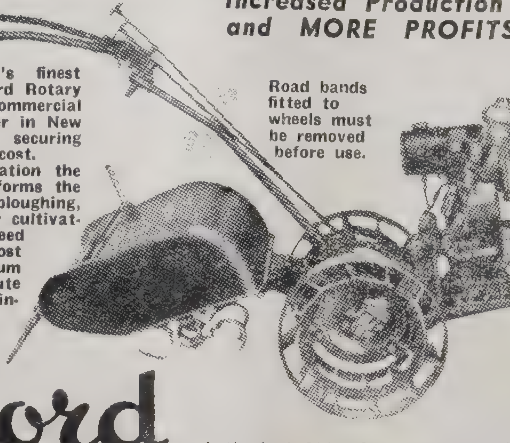

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to consolidate, seedlings should be thinned later to 3 to 4in. in the rows. The sowing of beet should be attended to as advised in last month's notes.

Celery

In central and northern districts an early celery can be set out during the month in beds or trenches in soil that has been heavily manured. Beds are usually made 4 to 6 rows wide with the plants set out 10 to 12in. apart each way; in trenches a double row 9 to 12in. apart with the same spacing between the plants is satisfactory. The trench can be any depth up to 12in. Blanching of double rows can be done by drawing the soil high against the ribs, taking care not to allow any to get into the centre of the plants, or by wrapping individual plants with stout paper. Beds containing multiple rows are best blanched by placing a length of 12in. x 1in. timber along the outside edges of the bed. Blanching should not be commenced until the plants are about 3 weeks from maturity, as their development will otherwise be arrested.

In preparing the bed a fertiliser mixture of 4 parts blood and bone, 2 parts superphosphate, and 1 part potash should be broadcast over the area at the rate of ¼lb. to a square yard and worked into the soil after digging.

Celery should be kept free from weeds and a coverage of Bordeaux maintained on the foliage by spraying every 10 to 14 days. Various proprietary copper compounds have been found quite effective against leaf spot (*Septoria apii*), which is the principal fungous disease of celery in most districts. Where aphis is also troublesome the spray can be combined with nicotine sulphate 1 : 800 (1 fluid ounce of nicotine sulphate, 2oz. of soap, 4 gallons of water). Celery should not be planted on a part of the garden which has just been cleared of a carrot crop which has been affected by the carrot rust fly, as the pest is also liable to attack celery. If no ground other than that infested with rust fly is available for the celery, horticultural naphthalene should be broadcast along the rows at the rate of 4oz. to 20ft. of row, covering the foliage and about 6in. on each side of the plants. Naphthalene must be applied regularly, as it is volatile and acts only as a deterrent. It should not be applied within 14 days before harvesting, or there may be some residual flavour of naphthalene after cooking.

Kumara

"Slips" or rooted cuttings from which kumaras are grown can be purchased from most seedsmen in districts where the crop can be successfully matured. A sheltered situation is preferable and the slips should be planted shallowly in light, sandy soil ridged as for potatoes, except that the soil is ridged before planting. The rooted cuttings are planted 18in. apart on the ridges. A suitable fertiliser for most soils is 1 part sulphate of ammonia, 3 parts superphosphate, and 1 part potash. This can be applied at the rate of 1½lb. to each 5 yards of row and well worked into the soil before setting out the plants.

Lettuce

Lettuce cannot be grown successfully under dry conditions. If the soil is aerated, well drained and cultivated, and rich in humus, the crop responds well to irrigation or watering, provided the soil does not afterward set hard. Crisp, sweet, and tender heads can be produced only by quick growth, which may be induced by organic liquid manure, nitrate of soda, or sulphate of ammonia at the rate of 1 to 2oz. to 4 gallons of water.

In the hotter or drier districts at this time of year it is preferable to sow the seeds thinly (¼in. deep in rows 12in. apart) and later to thin the plants to 9in. apart in the rows rather than transplant them. The rows should be watered after thinning to settle the soil back around the plants that are left; otherwise they may receive a check which will later result in premature seed development.

Varieties are available to suit various climatic conditions in New Zealand. In the hotter central and northern districts a variety such as Great Lakes, Imperial 847, or Imperial 44 should be chosen; other good varieties for more general use are Iceberg, Success, New York, and Neapolitan (summer).

Parsnips

Though parsnips are not generally lifted until after the first frosts, they must be sown early enough to enable them to attain full development before the onset of winter slows or stops growth.

Intermediate and stump- or turnip-rooted varieties, which mature earlier than the long varieties, are available, but they have never found such favour with the public as have the similar types of carrot and beetroot.

To obtain long, straight, unforked roots, the ground, unless it is of a very loose, open nature, must be dug to a depth of two or even three feet. As this entails too much work for the average home gardener, the method sometimes adopted is to make deep holes with a crowbar 9in. to a foot apart and fill them with fine, suitably-prepared soil—potting soil will do. The soil in the hole should be firmed and in each 4 or 5 seeds should be sown. When the young seedlings are established only the strongest one should be left. The reason for the seemingly wasteful rate of sowing is that parsnip seed has a very low germinating capacity (even of one-year seed it is only about 65 per cent.). A few lettuce or radish seed sown between each parsnip "station" should germinate quickly and will serve not only to mark the position of the rows but will provide a quick-maturing crop that may be harvested before the parsnips require the intervening space.

Though earlier sowing is generally preferred in the south, November or even December sowings are usual elsewhere. Sow the seed ¼ to ½in. deep in rows 15in. apart in deeply-dug, well-drained soil of good humus content; soil that was heavily manured for a previous crop is excellent. It is usual to thin to about 4 to 6in. apart in the rows.

Peas

Peas can still be sown with assurance of success in the cooler parts of the country. In districts which experience hot, dry conditions throughout most of the summer, peas often fail because of the attack of powdery mildew (*Erysiphe polygoni Dc.*). This is a different mildew from that which is common in wet weather—downy mildew (*Peronospora viciae-Berk*)—and can be controlled, except where its attack is well established and environmental conditions especially favour it, by regular dusting with finely-powdered sulphur or spraying with colloidal sulphur (2 fluid ounces to 4 gallons of water).

A cool, moist, well-drained loam of high humus content is preferred, and where continuance of these conditions is assured successive sowings should be made.

Potatoes

Cultivation of established potato crops should be attended to by the removal of weeds and the banking of soil from between the rows against the haulms and developing tubers, so that the rows are hilled in steep inverted V shape. This affords protection against the depredations of the potato tuber moth and also ensures that, should the foliage become badly infected with late blight, spores are not so likely to be washed on to the tubers and the danger of tuber infection is thus lessened.

Potatoes can still be planted as advised in last month's notes. A main crop variety can be chosen. Well-drained soil rich in humus is preferred, and virgin soil or soil heavily manured for a previous crop is suitable. Grass clippings or a green crop dug in before planting will provide humus. Lime is rarely necessary, as the potato does well in an acid soil, and the alkaline condition induced by the application of lime favours the development of the disease known as scab, which

FORCING RHUBARB IN FRAMES

1

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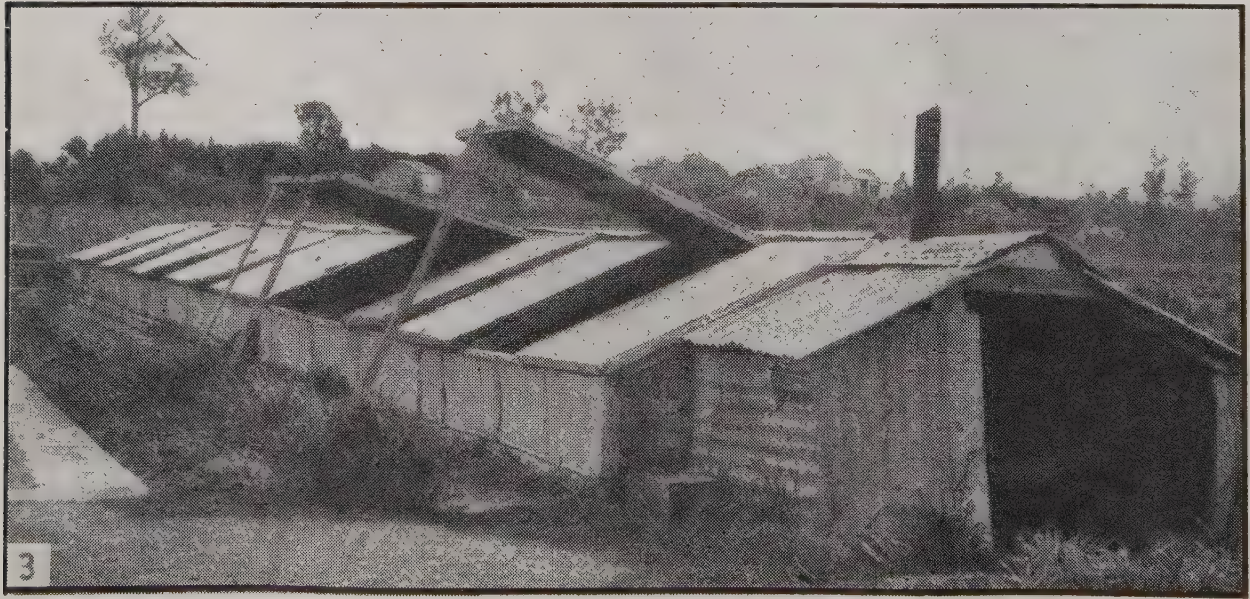
Forced rhubarb, with its tender, succulent stems, is a delicacy which finds a ready sale. The home gardener usually forces his rhubarb roots by covering them with boxes to exclude light, and covering the boxes with straw or sacking. Commercial rhubarb forcing is done by Mr. G. W. Hallam, York Street, Masterton, by lifting well-grown roots in the autumn and packing them into specially-constructed deep frames heated with a small boiler and hot-water pipes. The frame (Fig. 3) requires hinged lights, but as the rhubarb grows in the dark, the lights are not glazed, but covered with wood, sacking, or other light-proof material. Soil is packed between the rhubarb crowns, and the frame kept warm, but little water is needed until the new stems are growing strongly (Fig. 1). When the stems are ready they are pulled carefully by means of a sideways twist which does not injure the crowns, and the stalks are made into neat bundles (Fig. 2) and marketed. The bright green of the leaves and the red, tender stems make forced rubarb a most attractive vegetable. The crowns are usually thrown away after being forced, and are replaced by a new batch each year.

(Photographs by Hope, Cross, and Richardson.)



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is also common in soils poor in organic matter.

Recommended main crop varieties are Aucklander Short Top, Inverness Favourite, Dakota, and King Edward.

Potato Scab: Though this disease does not cause the tubers to rot, affected tubers are more readily attacked by decay organisms during storage than those with sound skins. The fungus attacks growing tubers only; when the tuber has completed its growth the production of scab ceases. The actual loss in yield is not great, but the diseased tubers are rather unsightly. Each of several species of soil-inhabiting fungi is responsible for producing a particular type of the disease, but common scab is caused by the fungus *Actinomyces scabies.*

Late Blight (*Phytophthora infestans*): This disease, which is also known as Irish blight, does not appear every season in some districts, but in most parts of the North Island and in some parts of the South Island it is wise to spray, since neglect of this precaution may result in total loss. Spraying should commence when the plants are about 5 to 8in. high and be repeated at monthly intervals. If, in spite of precautions, the foliage is much infected and the crop cannot be dug at once, the haulms should be cut off at ground level or removed by pulling them off the tubers while standing on the potato ridge with one foot on each side of the plant to hold the tubers in place.

Rhubarb

Repeated pulling of the stalks is an unnatural and exhausting process to rhubarb plants, and manurial treatment should be carefully adjusted. Organic liquid manure, nitrate of soda, or sulphate of ammonia at the rate of 1 to 2oz. to 4 gallons of water should be applied regularly until just after the last pulling, after which no more stimulating fertiliser should be applied, as early dying down of the leaves and ripening of the crowns is an important factor in successful rhubarb culture.

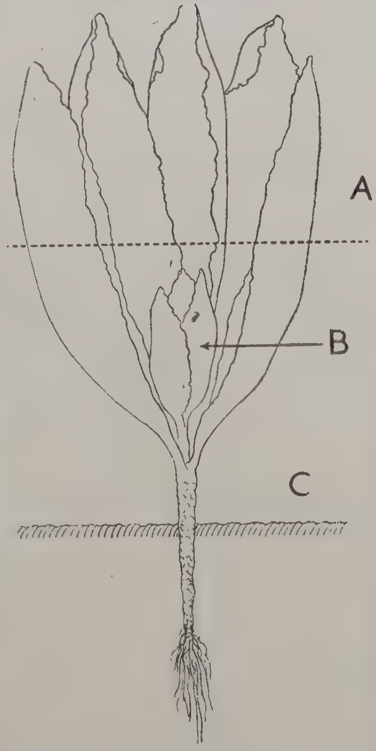
Seed Sowing

Seed of a cauliflower variety which matures before autumn frost is likely to cause damage can still be sown. In districts subject to severe early autumn frosts the protecting or semi-protecting varieties such as Walcheren, All Seasons, or Veitches Self-Protecting are excellent. The cauliflower is a comparatively delicate plant and a check that would have little effect on a cabbage or even a broccoli will cause it to "button." Seed should be sown ½in. deep in a well-drained, deeply-cultivated soil of good humus content, and when the young plants are about six weeks old they should be carefully transplanted to their permanent positions in well-drained and cultivated soil very rich in humus. It is important that the plants be carefully lifted. They should be watered first and plants will be less likely to be checked in hot, dry weather if about a third is cut off the ends of the leaves to reduce leaf area and thus cut down loss through transpiration. This is a normal practice with commercial growers who set out plants in hot weather. Set the plants 18 to 24in. apart in the rows, with the rows 2ft. to 2ft. 6in. apart, the actual distance within these limits being determined by the size of the variety chosen.

Winter Greens

Broccoli (both heading and sprouting), curly kale, savoy cabbage, and brussels sprouts should now be sown. Varieties of savoy cabbage and broccoli are available that mature at any period from autumn to spring, and if suitable varieties are chosen, continuity of supply can be assured. Cultural directions given before for the cauliflower are applicable, and considering their importance in the scheme of supply, winter greens deserve no less care.

TRANSPLANTING BRASSICAS IN HOT WEATHER



Cut off outer leaves to level marked A, leaving young leaves in centre (B) untouched. Planting depth is indicated at C.

Leeks

In districts where the autumn is long enough to permit development to take place, leeks sown now can be used to provide supplies until late spring or early summer.

Swedes

Garden swedes are a particularly useful addition to the garden, especially in the south, where colder conditions enhance their quality and flavour. They are high yielding and not fastidious about soil conditions; a moderately light loam containing plenty of organic matter will give the best results. A dressing of superphosphate at 1 to 2oz. a square yard is generally advantageous. Swedes are usually grown for late autumn and winter use, and only in southern districts is it advisable to sow now. In the north seed can be sown in January. Swedes are essentially a cool weather vegetable and moist conditions are essential to good crops. Roots grown in hot or dry weather are inclined to become woody and tough and the plant readily runs to seed.

Sow the seed ½in. deep in rows 12in. apart and thin to 6 to 8in. apart in the rows. Quarter of an ounce of seed will sow 100ft. of row.

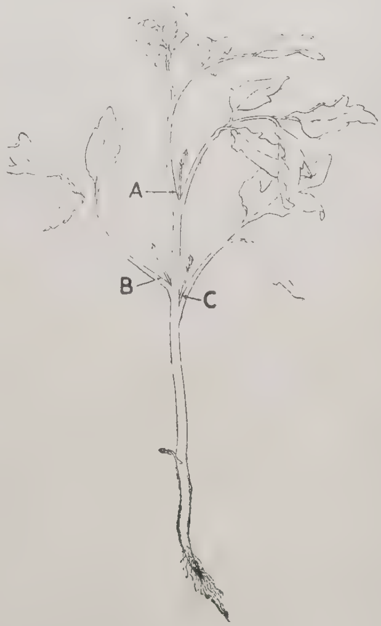
Good varieties are Laings Garden and Superlative.

Tomatoes

Pests and Diseases: It is usual to commence setting out tomato plants toward the end of October, except in Canterbury and southern districts, where there is danger of frost in most areas until about the second week in November. In districts where late blight, stem borer caterpillar, and looper caterpillar are troublesome it is advisable to apply Bordeaux prepared from 4oz. of bluestone and 5oz. of hydrated lime in 4 gallons of water plus 2oz. of lead arsenate powder. The first spray should be applied about 10 days after the plants have been set out in the field. It should be repeated every 2 to 4 weeks, according to the local severity of the disease and weather conditions, until the crop is fully grown.

Plants that show any deviation from normal should be rogued at once. Distortion of the young leaves or mosaic mottling may indicate infection with mosaic virus, different strains of which vary in the severity of their effect on the plant. Those which develop narrow, often distorted, fern-like leaves or have a stunted appearance usually produce little, if any, crop. They should be removed and burnt. Plants infected with spotted wilt, shown by bronzing of the foliage with a pattern of brown spots toward the base of the leaflets, and usually with a stunted appearance and a rolling and bunching of the top leaves, should also be burnt. Spotted wilt is one of the most serious diseases with which the tomato grower has to contend. It is commonly spread from diseased to healthy plants by thrips, and many garden plants (iceland poppy, dahlia, aster, zinnia, nasturtium, chrysanthemum, lettuce, and tobacco) are subject to attack and also serve to carry over the disease from season to season. The thrips are rather difficult to control, as they have a wide range of hosts, and in the warm, sheltered conditions which suit the tomato they are prolific breeders. Though tartar emetic sprays have been used with considerable success under glass, frequent spraying with nicotine sulphate (1 : 800) seems to have afforded the best control on plants grown outside. It is always advisable to plant tomatoes as far away as possible from susceptible ornamentals.

PRUNING TOMATOES



Pruning of tomato plants consists of pinching out shoots (A, B, C in diagram) in branch axils. Care must be taken not to remove the young flower trusses.

Tomato plants should not be set out in the field unless the ground is well drained and has warmed sufficiently. In cold or wet conditions the roots are subject to attacks of numerous weakly parasitic soil-inhabiting organisms which soon cripple or destroy them. The home gardener often fails to notice anything amiss with surviving plants except that they appear to have been checked for a while. Young plants can usually be helped by banking a little soil against their stems to enable them to develop adventitious roots, but early checks due to root rots almost invariably affect the plants in later life. Wilting, blossom end rot, and nutritional disturbances such as blotchy ripening are often traceable in part at least to such a cause.

Planting: Apart from the dwarf varieties, which do not require staking, but in wet seasons should rest on a layer of straw, and which as a rule require no pruning except a certain amount of leaf removed to allow the sun to ripen the fruit, all tomatoes should be given support and pruned by removing the shoots which occur in the angle of each branch as it grows out from the main stem. They can be grown on the single- or double-stem system as preferred. One advantage of the double-stem system is that the supporting stakes or wires do not need to be as high as those for plants grown on the single-stem system.

Soil preparation should preferably have been begun some time before planting out. Deeply-dug, well-drained medium or heavy loam containing plenty of humus is usually preferred. Fertiliser can be supplied by the addition of 4oz. of blood and bone or 5oz. of finely-ground bonedust plus a couple of handfuls of superphosphate to each 9ft. of row. This can be scattered in a furrow taken out with a hoe on the line on which the plants are to be set out, and the furrow afterwards closed by hoeing back the soil. Staked plants are usually set out 12 to 15in. apart in the rows and with the rows about 3 to 4ft. apart. Dwarfs may be set out 2ft. x 3ft., but where space permits it is usuallly advisable to plant 3ft. x 3ft. or 3ft. x 4ft.

Dwarf varieties recommended are Tatura Dwarf Globe, South Australian, and Red Dwarf.

Tall varieties recommended are Best of All, Market King, and Potentate.

Other Frost-tender Subjects

Sweet corn, cucumber, marrow, pumpkin, melon, squash, capsicum, and egg plant can be sown or set out as described in last month's notes, though in most of the central and southern parts of the South Island young plants require protection from the frost until the second week in November.

SHOW DATES

THE following are dates and venues of A. and P. shows in November, December, and January.

November 6—Ashburton A. and P. at Ashburton.

November 7—Amberley A. and P. at Amberley.

November 7 and 8—Manawatu and West Coast A. and P. at Palmerston North.

November 13 and 14—Canterbury A. and P. at Christchurch.

November 14 and 15—Wanganui A. and P. at Wanganui.

November 15—Kaikohe A., P. and H. at Kaikohe.

November 15—Taieri Agricultural Society at Outram.

November 18 and 19—Thames Valley A., P. and H. at Te Aroha.

November 18 and 19—North Otago A. and P. at Oamaru.

November 21 and 22—Nelson A. and P. at Richmond.

November 21 and 22—Egmont A. and P. at Hawera.

November 22—Bay of Island P. and I. at Waimate North.

November 22—Kelso A. and P. at Kelso.

November 22—Courtenay A. and P. at Kirwee.

November 25 and 26—Otago A. and P. at Dunedin.

November 28—Clutha and Matau A. and P. at Balclutha.

November 28 and 29—Stratford A. and P. at Stratford.

November 29—Tokomairiro A. and P. at Milton.

November 29—Winton A. and P. at Winton.

November 29—Hauraki A. and P. at Paeroa.

December 2 and 3—Gore A. and P. at Gore.

December 6—Wyndham A. and P. at Wyndham.

December 6—Motueka A. and P. at Motueka.

December 9 and 10—Southland A. and P. at Invercargill.

December 13—Otago Peninsula A. and P. at Portobello.

January 1—Nuhaka A. and P. at Nuhaka.

January 9 and 10—Wairoa County A. and P. at Wairoa.

January 10—Blueskin A. and P. at Waitati.

January 17—Waiau A. and P. at Tuatapere.

January 17—Waikouaiti A. and P. at Waikouaiti.

January 23—Palmerston and Waihemo County A. and P. at Palmerston.

January 23 and 24—Taumarunui and District A. and P. at Taumarunui.

January 24—Marton District A. and P. at Marton.

January 26—Helensville A. and P. at Helensville.

January 29—Tauranga A. and P. at Tauranga.

January 30 and 31—Horowhenua A. and P. at Levin.

January 31—Waipukurau A. and P. at Waipukurau.

FARMING IN NEW ZEALAND

The Canterbury District

CANTERBURY has much cause to be proud of its farming. In the world's frozen meat markets the name Canterbury lamb for many years has stood for outstanding quality, and the province's wool with its relatively-high proportion of the finer sorts is an important part of the Dominion's clip. Canterbury is the principal arable-cropping region of New Zealand and also grows the great bulk of the supply of pasture seeds that has a dominant place in the expanding and valuable seed trade. The development of small holdings in the province has been particularly extensive and along widely-varied and interesting lines. In the first part of this article, which will be concluded in next month's issue of the "Journal," R. P. Connell, Fields Superintendent, Christchurch, describes the various factors affecting farming in the province and the main types of farming carried out.

ORGANISED European settlement of Canterbury Province* began about 100 years ago, when the pioneers found a land different from what it is today. The countryside then consisted of large areas of swamps or marshes which have since almost disappeared, and extensive almost treeless plains, gentle downs, and hills on all of which tussocks were a prominent feature of the vegetative cover. The tussocks have now mainly been removed from the plains and the gentle downs, although millions of acres of tussock grassland remain on the more broken downs and on the hills merging into mountains. The Native population was comparatively small and not hostile.

From the outset Canterbury was an inviting land to the pioneering primary producer. For the pastoralist the tussock grassland provided nutritive grazing under healthy conditions and a large part of the plains provided high fertility and suitable conditions for immediate arable cropping.

In the days of the earlier settlers the only serious bar to internal transport was the large and swift rivers that crossed the plains from the mountain ranges. Material for road making was readily available and the topography facilitated the building of railways. The climate of Canterbury is very suitable for the maintenance of health and vigour in Europeans, and the conditions which favoured the success of the pioneers are essentially the same today.

LAND UTILISATION

The unoccupied, barren, and unproductive land, totalling 2,320,000 acres, is mainly on the high parts of the main divide, the Southern Alps, and neighbouring spurs. It includes glaciers and snowfields which feed lakes and great rivers throughout the year and especially in summer. This extensive area is a distinct provincial asset, not only because of its scenic and recreational value, but because it is a magnificent, unfailing reservoir which is already being exploited for the production of electric power for irrigation and water supply of farms and homes and is likely to be exploited much more extensively in the future.

The area in tussocks and other native grasses forms more than half of the occupied land. It constitutes a belt running the whole length of the province and reaches mainly from near the divide to about 50 miles east, but in both the north and the south it becomes considerably wider, reaching the coast in the north and almost reaching it in the south.

Fern, scrub, and secondary-weed growth, which are found generally on shady faces, occupy a smaller proportionate area in Canterbury than they do in the remainder of the Dominion, and although Canterbury has 23 per cent. of the unimproved land of the Dominion, it has only 4 per cent. of the fern, scrub, and secondary growth.

The bush is mainly in scattered patches in the vicinity of the upper reaches of the great rivers—the Waiau, Hurunui, Waimakariri, and Waitaki—but in places small patches reach almost to the plains, for example, at Oxford and Alford Forest. The bush consists of beech forest (often and incorrectly called birch forest) and is usually on the higher and poorer slopes.

AGRICULTURAL AREAS IN CANTERBURY (1940-41)*

AREA OF PROVINCE: 9,780,000 acres†

OCCUPIED: 8,080,000 acres

UNOCCUPIED: 1,700,000 acres

	acres		acres
IMPROVED	2,721,000	**UNIMPROVED**	5,360,000
Grasses, clovers, and lucerne ..	1,919,000‡	Tussock and other native grasses	4,484.000
Grain and pulse crops	418,000	Native bush	123.000
Green, forage, and root crops ..	242,000	Fern, scrub, and secondary growth	129.000
Plantations for timber and shelter	78,000	Phormium	4,000
Orchards	2,000	Barren and unproductive ..	620,000
Gardens, including gardens and grounds about residences ..	19,000		
Fallow	43,000		

* The year 1940-41 was specially selected to avoid showing any changes that might have been caused by temporary wartime conditions.

† Areas are given to the nearest thousand acres.

‡ Does not include areas sown with grasses and clovers in conjunction with other crops.

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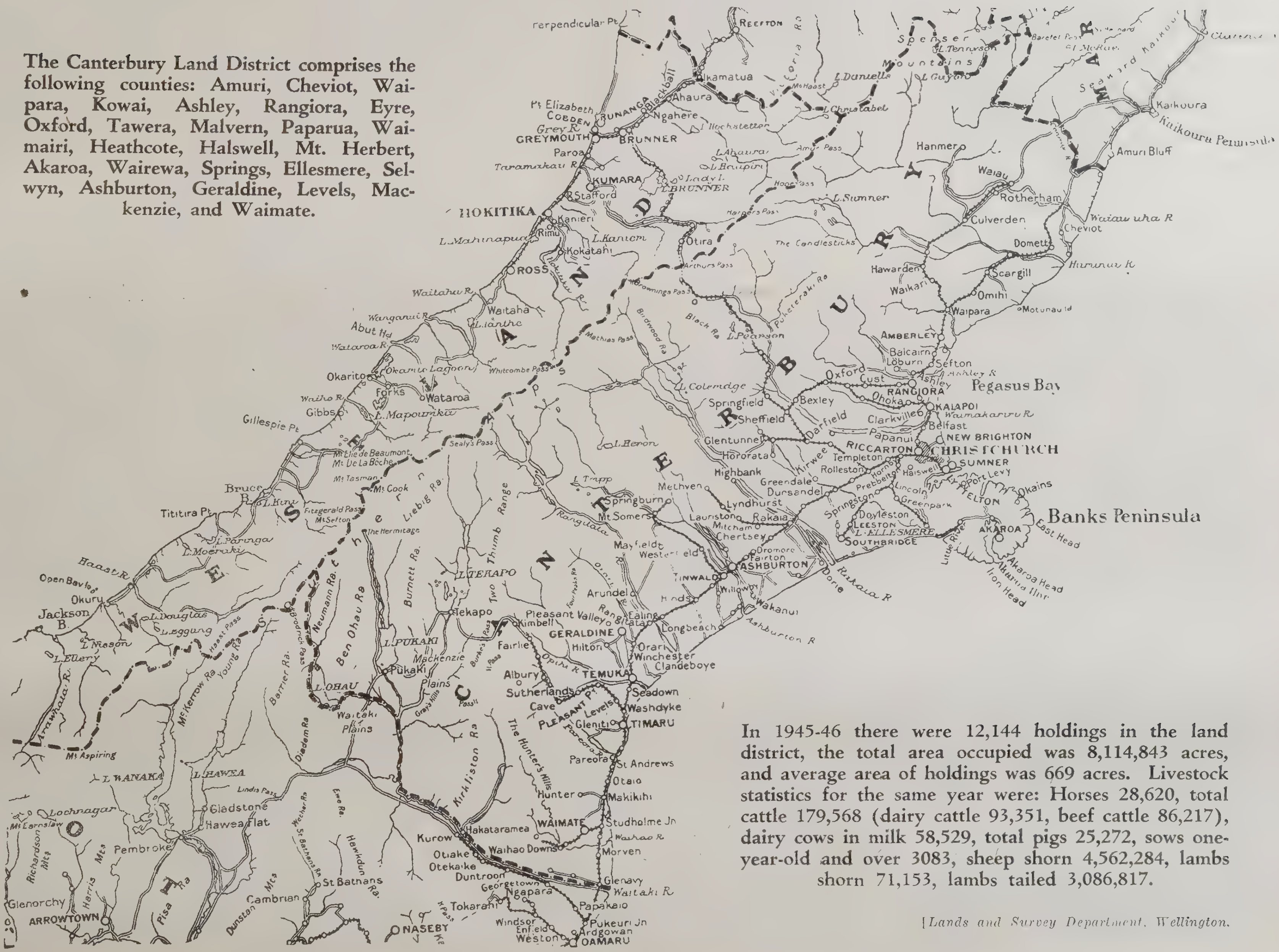
* The term Canterbury Province means the Canterbury Land District.

THE CANTERBURY PROVINCE

The Canterbury Land District comprises the following counties: Amuri, Cheviot, Waipara, Kowai, Ashley, Rangiora, Eyre, Oxford, Tawera, Malvern, Paparua, Waimairi, Heathcote, Halswell, Mt. Herbert, Akaroa, Wairewa, Springs, Ellesmere, Selwyn, Ashburton, Geraldine, Levels, Mackenzie, and Waimate.


CANTERBURY
WESTLAND
MARLBOROUGH
OTAGO
Perpendicular Pt
Reefton
Ikamatua
Ahaura
Blackball
Runanga
Pt Elizabeth
Cobden
Grey R
Greymouth
Brunner
Ngahere
Paroa
Taramakau R
Kumara
Stafford
L. Brunner
Hokitika
Kanieri
Rimu
L. Mahinapua
L. Kaniere
Kokatahi
Ross
Otira
Arthurs Pass
Waitaha R
Waitaha
L. Ianthe
Wanganui R
Abut Hd
Wataroa R
Okarito
Okarito Lagoon
Forks
Wataroa
Waiho R
Gibbs
L. Mapourika
Gillespie Pt
Mt Elie de Beaumont
Mt De La Boche
Mt Tasman
Mt Cook
The Hermitage
Fitzgerald Pass
Mt Sefton
Bruce B
Tititira Pt
L. Paringa
L. Moeraki
Haast R
Open Bay Is
Okuru
Jackson B
L. Douglas
L. Ellery
L. Mason
Haast Pass
Mt Aspiring
Arawhata R
Young Ra
McKerrow Ra
L. Wanaka
L. Hawea
Hawea Flat
Gladstone
Lindis Pass
Pembroke
Lochnagar
Mt Earnslaw
Richardson Mts
Harris Mts
Glenorchy
Arrowtown
Pisa Ra
Dunstan Mts
Cambrian
St Bathans
St Bathans Ra
Hawkdun Ra
Ewe Ra
Diadem Ra
Barrier Ra
Brodrick Pass
Neumann Ra
Ben Ohau Ra
L. Ohau
Waitaki Plains
L. Pukaki
Pukaki
Mackenzie Plains
L. Tekapo
Tekapo
Two Thumb Range
Burnett Ra
Liebig Ra
Sealy's Pass
Whitcombe Pass
Mathias Pass
Brownings Pass
Burkes Pass
Kirkliston Ra
The Hunters Hills
Kurow
Hakataramea
Waihao Downs
Otiake
Otekaike
Duntroon
Georgetown
Ngapara
Tokarahi
Naseby
Windsor
Enfield
Weston
Oamaru
Ardgowan
Pukeuri Jn
Papakaio
Waitaki R
Glenavy
Morven
Waihao R
Studholme Jn
Waimate
Makikihi
Hunter
Otaio
St Andrews
Pareora
Glenitī
Timaru
Washdyke
Seadown
Levels
Pleasant Pt
Cave
Sutherlands
Albury
Fairlie
Kimbell
Pleasant Valley
Geraldine
Hilton
Temuka
Orari
Winchester
Clandeboye
Rangitata
Ealing
Longbeach
Hinds
Arundel
Mayfield
Westerfield
Tinwald
Willowby
Wakanui
Ashburton R
Ashburton
Fairton
Dromore
Chertsey
Mitcham
Lauriston
Rakaia
Rakaia R
Dorie
Mt Somers
Springburn
Methven
Lyndhurst
Dunsandel
Greendale
Highbank
Hororata
Glentunnel
Sheffield
Springfield
Darfield
Kirwee
Bexley
Oxford
Cust
Rangiora
Ohoka
Kaiapoi
Clarkville
Belfast
Papanui
Riccarton
Templeton
Rolleston
Hornby
Halswell
Christchurch
New Brighton
Sumner
Port Levy
Lyttelton
Lincoln
Prebbleton
Springston
Greenpark
Doyleston
Leeston
L. Ellesmere
Southbridge
Little River
Akaroa
Okains
East Head
Akaroa Head
Akaroa Hbr
Iron Head
Banks Peninsula
Pegasus Bay
Waimakariri R
Ashley R
Ashley
Sefton
Loburn
Balcairn
Amberley
Waipara
Motunau Id
Omihi
Waikari
Scargill
Hawarden
Domett
Hurunui R
Cheviot
Waiau-uha R
Rotherham
Culverden
Waiau
Hanmer
Amuri Bluff
Kaikoura
Kaikoura Peninsula
Seaward Kaikoura
Spenser Mountains
L. Tennyson
L. Guyon
L. Daniells
L. Christabel
L. Sumner
Amuri Pass
Hope Pass
Harpers Pass
The Candlesticks
Puketeraki Ra
Black Ra
L. Pearson
L. Coleridge
Birdwood Ra
L. Heron
L. Tripp
Rangitata
Clarence

In 1945-46 there were 12,144 holdings in the land district, the total area occupied was 8,114,843 acres, and average area of holdings was 669 acres. Livestock statistics for the same year were: Horses 28,620, total cattle 179,568 (dairy cattle 93,351, beef cattle 86,217), dairy cows in milk 58,529, total pigs 25,272, sows one-year-old and over 3083, sheep shorn 4,562,284, lambs shorn 71,153, lambs tailed 3,086,817.

[Lands and Survey Department, Wellington.

[V. C. Browne photo.

Founded in 1850 by the Canterbury Association, Christchurch, capital of the Canterbury Province, has a population of 112,681. It is liberally supplied with public parks and reserves, and bears the closest resemblance to an English town of any town or city in New Zealand. The influence of its English founders is seen in the names of its streets and squares, the architecture of its old buildings, and in the fine avenues of trees bordering the site of the original settlement.

Tussock Belt

The large tussock belt with its scattered fern, scrub, secondary growth, and bush is a tract which is generally so hilly and mountainous that it is not ploughable, but since the time the first European settlers arrived in the province it has proved very suitable for sheep farming. Although the tussock belt generally is not ploughable because of its topography, throughout it are river flats, river terraces, and downs which, though restricted, are ploughable. At times these are valuable for growing forage crops to tide the flocks over seasons when the feed on the tussock grassland is unduly meagre. On those properties where the growing of forage crops is impracticable the flocks tend to draw more upon their bodily reserves built up during periods of plenty to sustain them during seasons when the feed directly available from pastures is scant.

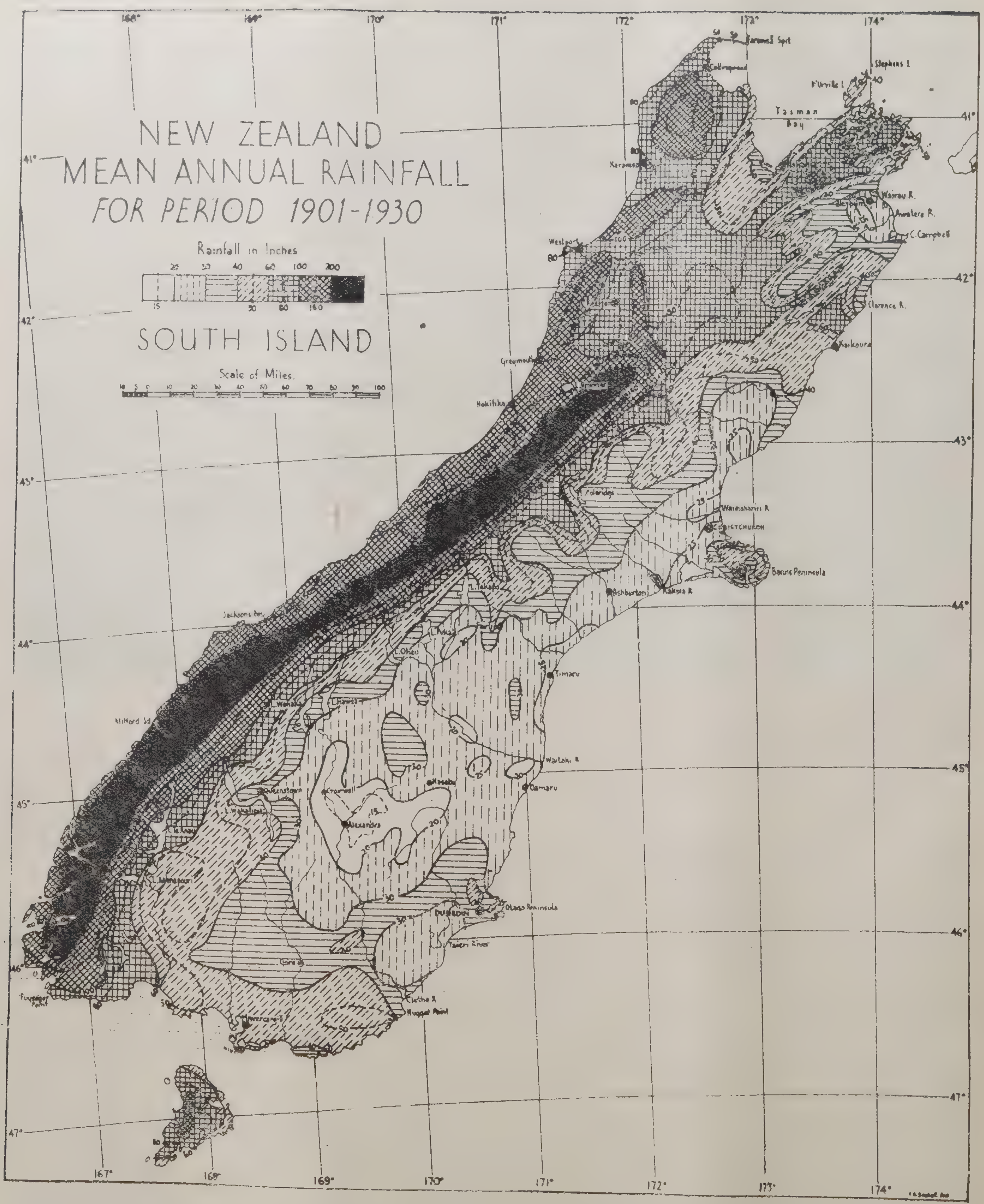
Having an acreage of between 600,000 and 700,000 under cultivation each year for the production of grain and forage crops, Canterbury is the principal arable-farming province of New Zealand. Arable cropping is carried out largely on the extensive plains and on the river flats and gentle downlands in the vicinity of those flats.

Although arable cropping stands out in Canterbury farming much more than it does in the farming of any other part of the Dominion, it is far from having a dominating position in Canterbury, even in the arable-farming belt. The total area cultivated is about 2,721,000 acres. On the average about 650,000 acres are in arable crops annually and 220,000 acres of pasture is sown on land previously in pasture or under cultivation. This means that usually less than one-quarter of the arable land is under cultivation each year, about one-twelfth is sown in pasture, and another twelfth is broken out of lea each year and when broken out of grass it remains under cultivation for about three years. That indicates that land is generally spelled under grass for a substantial interval between successive periods of cultivation and that in a 12 years' cycle the arable land is on the average under grass for nine years.

Afforestation

The plantations, in which *Pinus radiata* is prominent, although somewhat limited, are useful and attractive. Important plantations at Hanmer Springs, at Balmoral, on the north bank of the Hurunui River, and in the Ashley and Eyrewell districts in the vicinity of Christchurch are owned by the State and have replaced a good deal of scrub. The Selwyn Plantation Board and the Ashburton County Council have been active in tree planting south of Christchurch, and many private landholders throughout the province have planted trees.

When the first Europeans arrived in Canterbury the plains, apart from patches of bush associated with swampy conditions, as at Riccarton Bush, near Christ-


NEW ZEALAND
MEAN ANNUAL RAINFALL
FOR PERIOD 1901-1930
Rainfall in Inches
15 20 30 40 50 60 80 100 150 200
SOUTH ISLAND
Scale of Miles.
10 5 0 10 20 30 40 50 60 70 80 90 100
168° 169° 170° 171° 172° 173° 174°
167° 168° 169° 170° 171° 172° 173° 174°
41° 42° 43° 44° 45° 46° 47°
Farewell Spit
Collingwood
Stephens I.
D'Urville I.
Tasman Bay
Karamea
Nelson
Wairau R.
Blenheim
Awatere R.
C. Campbell
Westport
Reefton
Clarence R.
Kaikoura
Greymouth
Hokitika
Arthur's Pass
Coleridge
Waimakariri R.
CHRISTCHURCH
Banks Peninsula
Ashburton
Rakaia R.
L. Tekapo
L. Pukaki
L. Ohau
Jacksons Bay
Timaru
L. Hawea
L. Wanaka
Milford Sd.
Waitaki R.
Oamaru
Naseby
Cromwell
Queenstown
L. Wakatipu
Alexandra
L. Te Anau
L. Manapouri
Otago Peninsula
DUNEDIN
Taieri River
Gore
Clutha R.
Nugget Point
Puysegur Point
Invercargill

[Reproduced by permission of the Meteorological Office of the Air Department, Wellington, from maps prepared by C. J. Seelye, M.Sc., Ph.D.

[V. C. Browne photo.

Lyttelton, the chief port of Canterbury, is situated seven miles from Christchurch, with which it is connected by electric railway. In 1946, 3,004,369 tons of shipping entered the port, and a total of 737,461 tons of cargo were handled there, 395,077 tons being inward cargo and 342,384 tons outward.

church, were virtually treeless. Today in any extensive view of the plains from an elevated position, such as the Port Hills, near Christchurch, trees are an impressive feature of the countryside. The advantage of the change that has been made by planting trees has become increasingly obvious. European settlement in New Zealand has been associated with wholesale destruction of trees, but the Canterbury Plains provide a striking example of the reverse—probably the only example of any extent.

INFLUENCE OF CLIMATE

Some of the principal features of Canterbury farming are attributable to its climate, particularly rainfall, temperatures, and sunshine.

Rainfall

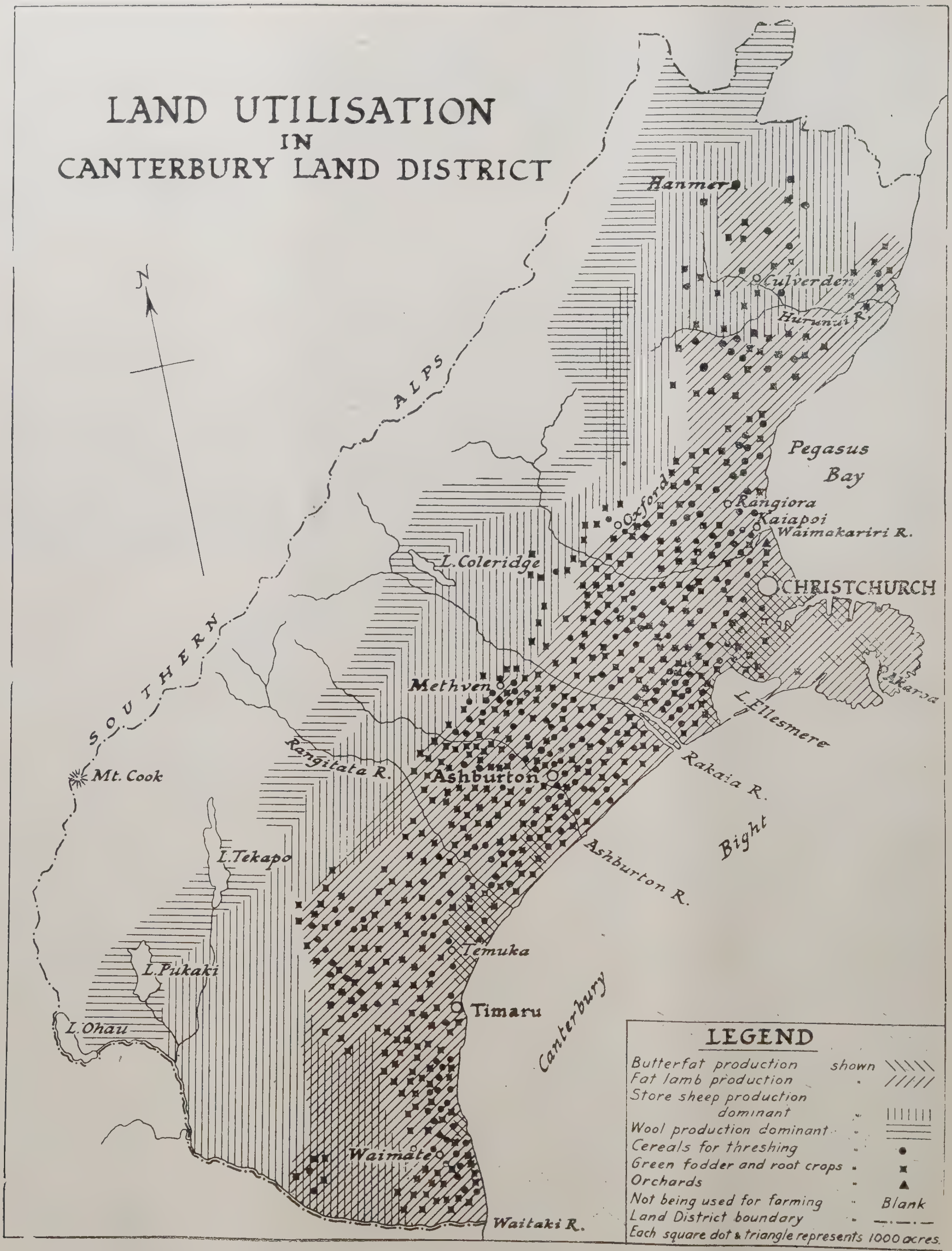
In New Zealand the climate of Canterbury is popularly considered to be a dry one. In comparison with other main districts this view may be justified, but measured by overseas standards the rainfall, even that of the drier regions, mainly along the coast, can scarcely be classed as low. Nowhere in the drier coastal belt is the annual rainfall under 20in. and there are only small strips near the coast where the rainfall is under 25in. The lowest rainfall in Canterbury is in a relatively-small inland area in the Mackenzie County in South Canterbury. Much of the coastal region has an annual rainfall ranging from 25 to 30in., although a fairly large part of the coastal district at the north end of the province has an annual rainfall of 30 to 35in. Banks Peninsula generally has a rainfall of 35in. or more, and a good deal of it has a rainfall of 40 to 50in. Inland from the belt of 25 to 30in. rainfall there is much country which receives 35 to 40in. of rain, and the rainfall increases with proximity to the main divide, near which the rainfall reaches 100in.

In farming the influence of rainfall on soil moisture is of prime importance, but in Canterbury there are two important modifying factors. Warm, drying westerly winds are prevalent and that is the reason why in most places forests have not established under about 60in. of rainfall, whereas in districts not subject to these winds forests have developed in the zone of 30 to 40in. of rain. But for the drying influence of the westerly winds much of the tussock belt in its native state would probably have been clothed in forest or scrub, and the history of much of the hill-country sheep farming would have been very different. In the tussock belt the drying westerlies are also the cause of some of the gullies and dark faces that are not exposed to the winds being clad in bush or scrub while the nearby exposed faces are clear. The determining factor is not the rainfall, but the soil moisture which can be used by the vegetation. This principle applies in reverse to an important extent in the coastal belt, which was naturally swampy. There under a rainfall of 25in. water supplied by seepage builds up the available soil moisture. Under this low rainfall forests grew in the past, and today, especially during seasons of low rainfall, the yields of both arable crops and pastures exceed those that could be obtained in a district relying on direct rainfall only.

Rainfall is well distributed throughout the year in most of Canterbury. This is shown by the average monthly rainfall for Christchurch and Hororata. Christchurch in the wettest month receives an average of 2.69in. of rain and in the driest month 1.69in., the average monthly rainfall being 2.1in. Hororata in the wettest month receives 2.76in. of rain and in the driest month 2in., the average monthly rainfall being 2.4in.

Temperatures

With some exceptions temperatures do not have an abnormal influence upon farming in Canterbury. Temperatures everywhere lie well


LAND UTILISATION IN CANTERBURY LAND DISTRICT
N
SOUTHERN ALPS
Hanmer
Culverden
Hurunui R.
Pegasus Bay
Oxford
Rangiora
Kaiapoi
Waimakariri R.
L. Coleridge
CHRISTCHURCH
Akaroa
Methven
L. Ellesmere
Rakaia R.
Rangitata R.
Ashburton
Mt. Cook
Bight
Ashburton R.
L. Tekapo
Temuka
L. Pukaki
Timaru
Canterbury
L. Ohau
Waimate
Waitaki R.
LEGEND
Butterfat production shown \\\\\
Fat lamb production /////
Store sheep production dominant |||||
Wool production dominant ☰
Cereals for threshing ●
Green fodder and root crops ■
Orchards ▲
Not being used for farming Blank
Land District boundary —·—·—
Each square dot & triangle represents 1000 acres.

[Drawn by Lands and Survey Department, Wellington.

within the temperate range, most of the province having an average annual temperature ranging from 53 to 57 degrees F. The range of temperatures over much of Canterbury is shown by the following table:—

	Hanmer Springs	Christchurch
Mean daily maximum	61.1 degrees	61 degrees
Mean daily minimum	40.6 degrees	44.3 degrees
Days of ground frost annually ..	144	93

Temperature is the factor that precludes any general success in the open air with relatively-tender crops such as citrus fruits, passion fruit, paspalum species, maize for grain, and kumaras, but over a good deal of Canterbury crops which are susceptible to frost injury—potatoes, marrows, pumpkins, and tomatoes—are raised successfully. Temperature is considered to contribute to the relatively-good quality of Canterbury potatoes by causing a considerable period of rest or slow growth, which is a factor in the success obtained with orchard crops and small fruits like black currants and gooseberries. On the other hand this period of rest reduces the extent to which grazing of grassland may be employed as the sole means of feeding livestock.

Although humidity generally is not abnormal, being similar to that of Nelson and Napier, it is low enough to check, but not prevent, the development of many fungous and insect pests.

Much of Canterbury annually receives about 2000 hours of bright sunshine, and although this does not distinguish the province from the rest of New Zealand, it is a most favourable characteristic of its climate. Such a supply of sunshine stimulates growth of crops and generally has a highly beneficial effect on the health of stock. A combination of climatic factors—sunshine, rainfall and its distribution, temperatures, humidity, and drying winds—is a basic factor in Canterbury being the outstanding grain-growing and seed-producing district of New Zealand, and the same climatic combination assists in the production of clean, healthy fruit of good quality.

Although the climate is not free from flaws, such as occasional snowstorms, hailstorms, unseasonable frosts, high winds, heavy floods, and periods of meagre rainfall, it is attractive from the viewpoint of many branches of farming, particularly mixed farming, in which meat production, grain growing, and seed production are all prominent.

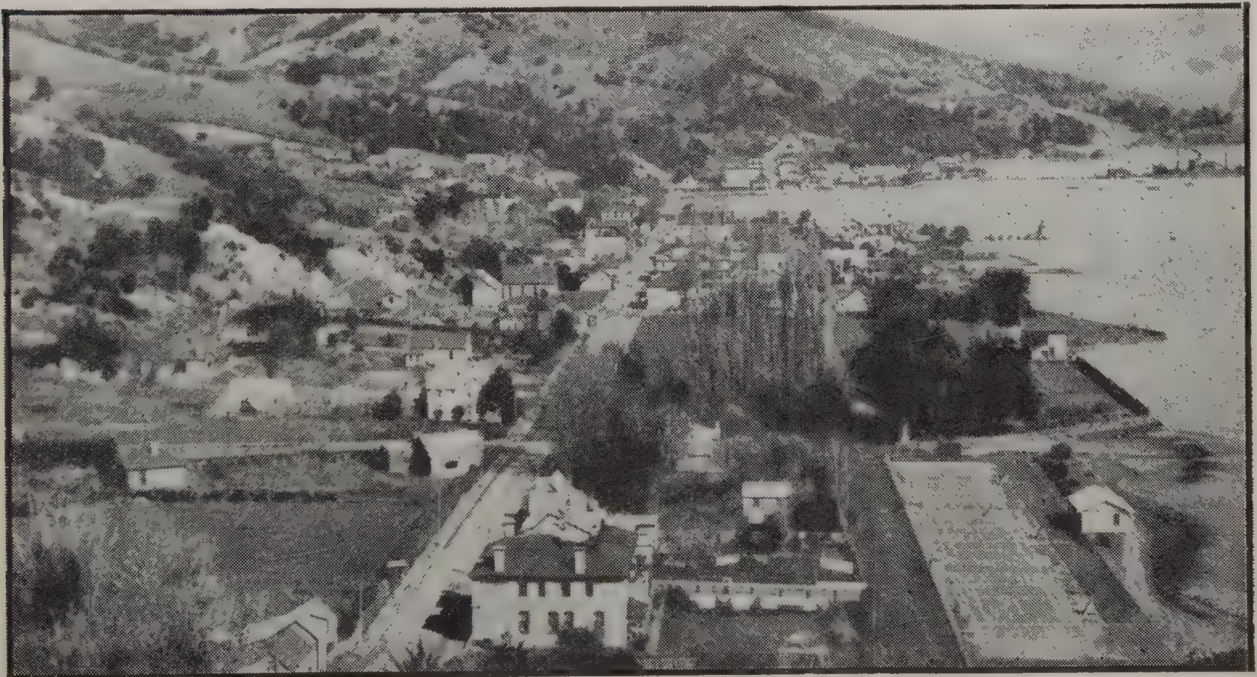
TOPOGRAPHY AND SOILS

Canterbury may be divided into three main topographical belts.

I. The Grazing Belt

A belt of high country and foothills reaches westward to the Southern Alps, from which subsidiary ranges branch eastward. It includes steep hills and mountains rising to 12,000 feet, downs, and river terraces. In this belt a series of large rivers—the Waiau, Hurunui, Waimakariri, Rakaia, Rangitata, and Waitaki—have carved out great valleys which in places contain wide, fairly extensive stretches of level to undulating alluvial sediments. Some of these stretches are in extensive intermontane basins, such as in the north in the vicinity of Hanmer Springs and Culverden and the Mackenzie Plains in the south, which are about 50 miles long and 25 miles in maximum width. Large lakes such as Tekapo, Pukaki, Ohau, Heron, and Coleridge are important features of the belt. This region, covered very largely by permanent grassland, is devoted almost entirely to sheep farming and may be called the Canterbury grazing belt, although some mixed farming is done in the lower parts. Some grain is produced, particularly in North Canterbury, and parts of some basins have been afforested, such as Hanmer Springs and Balmoral.

The soils of the grazing belt are derived mainly from greywacke, together with some sandstone, mudstone, and limestone. On the higher slopes of the ranges the soils are formed directly by weathering of the bedrock, but lower down they are often developed from the partial weathering of fragments of rocks and consist of these fragments in a range of sizes mixed with widely-varying quantities of



[*"New Zealand Farmer" photo.*

Originally a French settlement, Akaroa, which is situated on an extensive harbour, is the chief township of Banks Peninsula, where sheep and cattle raising and dairying are the main types of farming.

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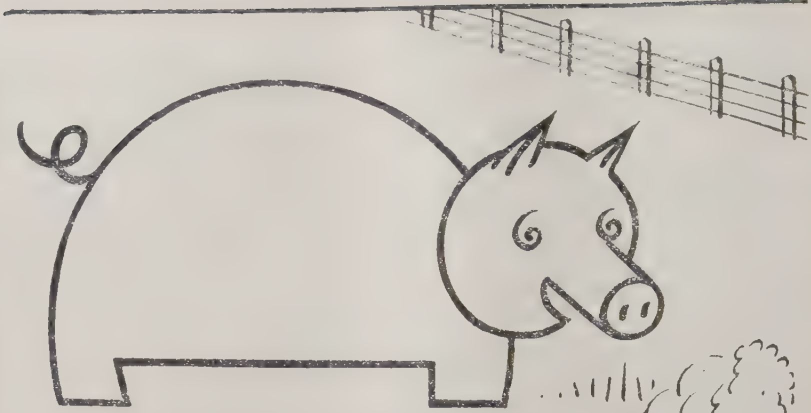

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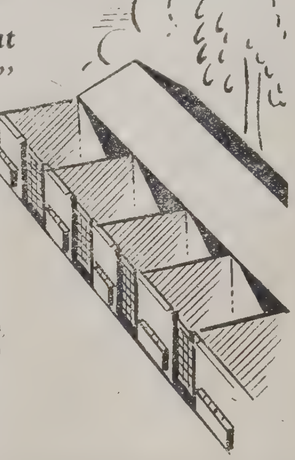

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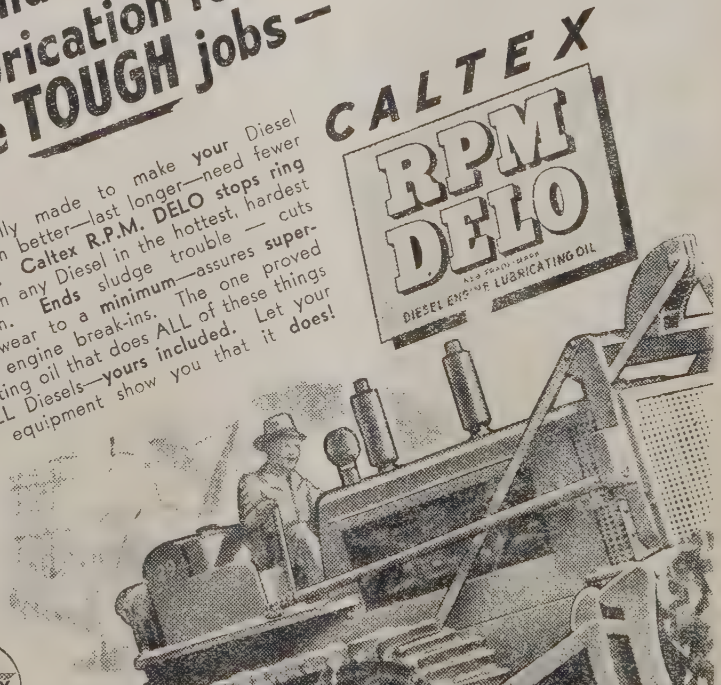

CALTEX

[*V. O. Browne photo.*

Hanmer, in the north of Canterbury, is the chief mineral water resort of the South Island, water from the hot springs there being used for medicinal baths in the Government sanatorium. Considerable areas in the Hanmer district have been devoted to important State afforestation schemes.

relatively-fine sediments. The properties of these soils have not been studied in any great detail and there would be little point in doing so, as there is little likelihood of their being immediately developed.

II. The Arable-cropping Belt

The arable-cropping belt is formed of (a) Canterbury Plains and (b) rolling foothill country and downs often adjacent to the plains, and relatively-gentle valleys.

Apart from the plains and neighbouring arable land, important arable-cropping regions are the roughly-triangular area in North Canterbury lying between Waipara and Parnassus and extending inland to about Waiau, and the coastal strip extending about 20 miles northward from the Waitaki River. These two regions have the same chief characteristics as the Canterbury Plains and the arable country adjacent to the plains.

(a) The Canterbury Plains

The Canterbury Plains, which form the major portion of the arable-cropping belt, extend from Waipara in the north to Washdyke, near Timaru, in the south. They are widest in the Ashburton district and rapidly narrow at their northern and southern ends, where the downs reach the coast. They consist of gravels, sands, silts, and clay formed mainly by the erosion caused by the streams which drain the mountains and hills to the west. In places loess (wind-borne sediment) covers the alluvial deposits. Over the ages a considerable amount of soil material has been carried by wind, mainly by the frequent, strong north-westerly winds. That explains why particularly good soils are often found on the south side of rivers where the north-westerly winds have deposited fine material removed from the broad river beds.

The development of the soil of the Canterbury Plains has been subjected to the vagaries of movements of wind and water and, as might be expected, the resultant surface pattern is most variable. There are a large number of soils, ranging from rich loams overlying clay to very thin, light soils on gravel subsoils, and within a district the properties of soils change in a relatively-short distance and in places abruptly. It is impossible, therefore, to divide the plains in a satisfactory way, even into relatively-small districts on the basis of the particular soil type of each district. The general position is illustrated within a few miles of Christchurch, where one may pass rapidly from land rich enough to grow outstandingly-good crops of onions, potatoes, wheat, and root crops, through intermediate stages to land so light and stony that it is unsuitable for arable cropping except for fairly-low yields of forage crops such as turnips.

If the influence of soil on farm practice and management is considered, the soils of the Canterbury Plains may be divided into the following main types. (Between any two of these types there are several intermediate sub-types, so that in any extensive region probably three dozen or more soils, each falling under one of the three main types, could be distinguished.)

(i) Light plain soils: These soils constitute the light, relatively-shallow and often stony country, some of which borders the foothills and some of which also is to be found throughout the plains. The South Island main trunk railway runs through a good deal of this country in the vicinity of Burnham, Ealing, and Rangitata. At times large stones make cultivation difficult, but the size and number of stones vary greatly. The fine sediment between the stones is richer than the appearance of the country might indicate, which is proved when the rainfall is ample or when the land is irrigated. Apart from the plains proper, there is a substantial area of these light soils in Canterbury, for example, at Waipara, Culverden, Balmoral, and Glenavy.

The chief items of income on the light plains country are fat lambs, wool, and wheat. Dairying, apart from a few house cows, as a rule is not attempted. The growing of forage crops such as turnips, rape, oats, lupins,

The Waimakariri River, like the other snow-fed rivers of Canterbury, rises in the Southern Alps, where the beech forest grows up to the snow-line. Canterbury river beds, which are wide and shingly, carry large quantities of flood water during the spring and summer thaws.

and temporary pastures has been an important feature of the farming of this land.

(ii) Dry, heavy plains soils: Most of these soils, which are termed heavy to distinguish them from the light plains soils of less depth and containing sands and gravel, are deep silt loams, but clay loams and heavy clay loams also occur. They are free of stones, and generally crops on them do not suffer readily from periods of drought. They occur freely in the area between the Lincoln and the Ellesmere districts, in the portion of the south bank of the Rakaia that stretches roughly between Rakaia and Methven, and in the Studholme Junction-Morven belt. Some of them respond unsatisfactorily to cultivation when it is not done at the suitable season, and at times care is necessary to avoid tilth being impaired as the result of cultivation being done when the soils are too wet. These soils are of considerable acreage and are in nearly all the counties on the plains, although they are not a predominating feature of any county. Quite often they vary considerably in thickness and merge into the light plains soils on the one side and on the other to soils which naturally tend to be wet.

(iii) Former swampland soils: On the coast between Rangiora and Timaru much of the land was originally swampland. In its natural state such plants as New Zealand flax (*Phormium*), niggerheads (*Carex*), toetoe grass (*Arundo*), cabbage tree (*Cordyline*), and raupo (*Typha*) were common on this land. There were extensive tracts of it both immediately north and south of Christchurch, a considerable part of which is actually built on it. Southward of Christchurch it stretches to Lake Ellesmere. It occurs extensively also in the coastal belt between the Ashburton River and the Rangitata River and it is to be found again toward the coast in South Canterbury near Temuka.

A big factor in the formation of these swamplands has been the seepage of water across the plains, which is on a much bigger scale than it appears. Some indication of its extent is given by the constant flow of three considerable streams, the Avon, Heathcote, and Styx, which are fed by springs that are largely supplied by seepage within five miles of the centre of Christchurch. This swampy coastal belt is rich in organic matter and nearly always contains substantial proportions of inorganic matter—silt and sand. The land which is developed from draining the swamps is therefore usually highly fertile.

The Marshland district on the outskirts of Christchurch is an important and particularly interesting portion of the swampy coastal belt. Generally soil management is efficient. The amount of arable cropping done is abnormally heavy; crops of onions, potatoes, carrots, and parsnips are grown in succession with little resting of the land. Although this practice has been followed for several decades, crops of more than 20 tons an acre of onions or of culinary carrots are far from uncommon and greater yields are not regarded as remarkable in that district.

The explanation of such persistent high productivity is twofold. First, the swamps had high natural fertility when they were drained, and, secondly, sound measures have been taken to maintain and perhaps improve the natural fertility. These measures have included the free use of animal manure, most of which comes from the numerous stables and poultry plants in and around Christchurch, and crops are often grown specifically for green manuring. Although the soils are naturally far from poor in organic matter, the farmers who use farm manure and green manure obtain results which well warrant this course.

(b) The Downlands

The soils of the Canterbury arable, rolling foothill country and downs—the Timaru downs and the Rangiora downs—are derived from alluvial material often covered by loess brought by wind. All these soils have come from the same parent rock—the mountainous backbone of the province—the same as the soils of the plains.

III. Banks Peninsula

Banks Peninsula consists essentially of volcanic hills up to 3000ft. high joined to the mainland by the extension of the Canterbury Plains. The area is formed mainly of basalt, often overlain, especially on the lower slopes near the sea, by a covering of ancient loess blown from the Canterbury Plains. At some places on gentle slopes near the sea the loess is 50ft. thick, but it thins out rapidly as the slopes become steeper and on the slopes near the hilltops there is little loess. Generally the carrying capacity of the loess is greater than that of the soils derived from basalt. This may be attributed in part to the exposed position of the basalt soils, which are richer in phosphate.

Owing to the hilly nature of Banks Peninsula little arable cropping is done there, market gardening and orchard production being carried out in the neighbourhood of Christchurch. The main types of farming are sheep and cattle raising and dairying, which is carried out in the valleys running inland from sheltered bays. The climate and quality of the soil generally are favourable to the growth of pastures, although it is checked in the higher parts by relatively-bleak conditions. Today Banks Peninsula carries about 30,000 cattle, including 7000 dairy cows, and 250,000 sheep. Production of the famous Akaroa cocksfoot seed, which was once a major project utilising 13,000 acres a quarter of a century ago, has dwindled and now only a few thousand acres are harvested annually.

Fertiliser Requirements

A significant feature of Canterbury soils generally is that, apart from restricted areas of soils derived from outcrops of limestone or basalt, they have been formed mainly from the breaking down or weathering of greywacke, sandstones, and mudstones. From this it might be expected that there would be some similarity in their content of mineral compounds which are often of importance in crop production, such as phosphates, potash, and lime, and this is borne out in a general way by the numerous field trials that have been carried out over the past few decades. These trials indicate that applications of phosphatic fertilisers and lime benefit a wide area and a large range of soils. A detailed consideration of the circumstances under which the use of phosphates and lime has a place in a sound farm programme is beyond the scope of this article. However, although much remains to be determined about the use of artificial fertilisers, enough is known to show that it would be advantageous to use both phosphates and lime much more extensively than they have been.

Erosion in the valley of the Esk River, a tributary of the Waimakariri River. This has been caused by the burning of the beech forest.

Soil Conservation

Throughout much of Canterbury in the past there has been an extensive, and at times serious, decline in soil fertility. The main cause has been accelerated erosion arising from the action of both moving water and wind and helped by cultivation, grazing animals, and the burning of the vegetative covering. Today, apart from portions of the high country, soil erosion in general is not serious, although unfortunately there are instances of serious fairly restricted erosion. Although at present throughout much of Canterbury the control of erosion is not an acute problem, it could become so and constant effort is necessary to avoid this happening. Fortunately this effort is not likely to necessitate any major or costly changes in the farming of the province. In fact, recently in the region which has been under cultivation the better and more durable pastures which are being evolved give promise of much better soil conservation than obtained previously, when many of the pastures were poorer and required more frequent cultivation as they were renewed. On the Canterbury lowland erosion is largely controlled or is readily controllable and the rebuilding of fertility is going on nowadays to a greater extent than it did about 20 years ago.

Erosion on the high-country belt of Canterbury is more serious. Without doubt the position can be remedied, but this will require some substantial measures which are under consideration, in particular by the soil conservation authorities, including the two Canterbury catchment boards.

Sunny northern faces on a North Canterbury high-country sheep farm in the Upper Waimakariri basin. Except for some beech forest, the land is good tussock country. Erosion is evident on the ridges.

MAIN TYPES OF FARMING

The nature of the production undertaken in Canterbury shows much variation; this is caused partly by differences in such matters as soils, climatic conditions, and size of holdings, and partly by differences in the skill and aptitude of the farmers themselves. Because of this variation any thorough classification of Canterbury farms on the basis of their production is somewhat intricate and difficult. The following simple classification outlines Canterbury farming broadly:—

Sheep Farming (Wool)

Holdings on which wool growing is the main consideration in Canterbury are necessarily large because at times the carrying capacity is about one sheep to five acres and the gross reve-

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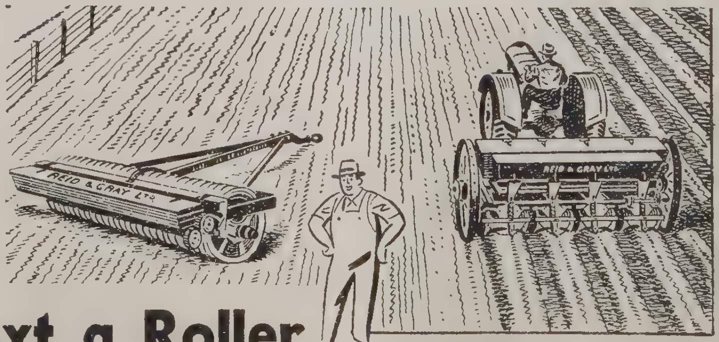

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nue only a few shillings an acre. These holdings form what are known as the Merino country and the fine half-bred country. The Merino country, which lies well toward the main divide, is of high snow risk and during the summer grazing the sheep range over the mountain tops. The stock are dependent chiefly on the native vegetation. The fine half-bred country is mainly closer to the coast than the Merino country, and although somewhat easier, it regularly carries a snow risk. The natural grazing may be supplemented by arable crops, mainly turnips, which as a rule are either grown on the lower, more gentle slopes or are purchased and fed out on the plains. Because of the better conditions the carrying capacity is usually greater and the holdings smaller. A holding on the Merino country may be about 60,000 acres and carrying about 12,000 sheep, whereas a holding on the fine half-bred country is often much smaller, some being about 10,000 acres and carrying about 4000 sheep. In the fine half-bred country the receipts from sales of surplus sheep may be a fairly substantial item, but on the Merino country such sales generally are of much less importance because most of the sheep produced are required to maintain the flock numbers, the death rate being relatively high and the lambing rate low.

Store Sheep Farming

The sheep farming country on which the raising of store sheep is a major project is usually easier country than that in which wool is dominant and generally is nearer to the coast. The more difficult of it is Corriedale or medium half-bred country, the remainder being mainly crossbred or three-quarter-bred country.

Snow risk is not usually associated with the Corriedale country, but in an adverse season losses through snowstorms may be serious. The crossbred country normally carries little or no snow risk. Some fattening, particularly of wether lambs, may be done throughout this group. A typical holding on the Corriedale country would be 8000 to 10,000 acres, carrying 5000 to 7000 sheep and selling off mainly store lambs and breeding ewes. An average holding of the other country in this group would be of about 2500 acres, possibly carrying 3000 or more sheep and selling off mainly wethers, some ewe lambs, and breeding ewes. Throughout the group forage crops may be grown to assist the grassland during difficult seasons, although such crops would play a smaller part in the Corriedale country. Returns from wool in the Corriedale country may constitute nearly half the receipts, but on the crossbred country it may provide less than a third of the receipts. The proportionate contribution of wool to total receipts varies, of course, from time to time in all sheep farming, according to variations in the price relationship between wool, meat, and other farm products.

Canterbury's extensive wool-producing sheep runs are situated on the large area of hilly, tussock-covered country between the plains and the Southern Alps.

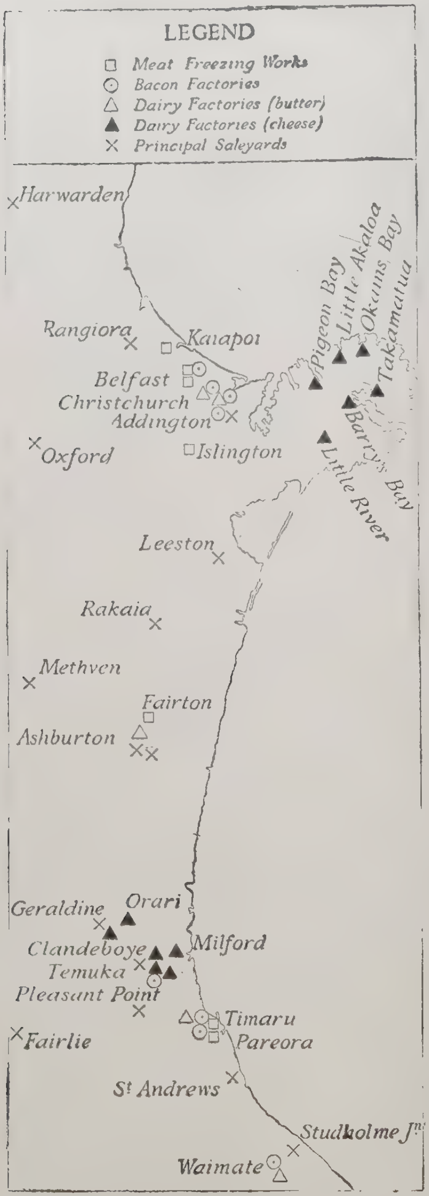
Practice is far from uniform on the holdings included in this group. Differences arise regarding the importance attached to cattle and such crops as turnips, hay, lucerne, and rape, and also regarding the attention given to the suppression of fern and scrub and to methods of pasture utilisation generally.

The great tussock grassland belt of Canterbury is utilised for both sheep farming for wool and for store sheep, which broadly are confined to the downs, hills, and mountains of that belt, but store sheep farming does include to a limited extent some plains country. Usually this plains country abuts the foothills, as in the Mt. Somers district. Apart from topography it is like the hill country used for store sheep farming, as the rainfall of 35 to 45in. is much higher than on most of the plains and the winters are longer and colder. The soils vary greatly from shallow, stony loams to deep, silt loams and in places boulders on the surface make cultivation difficult if not impracticable. The carrying capacity is about one ewe an acre. Wool may be about a third of the total revenue, but the bulk of the revenue comes from the sale of surplus stock, including ewes. The main item, however, is provided by lambs, some of which may be sold fat at weaning time and the remainder sold as store lambs. Arable cropping is almost confined to forage crops such as turnips, rape, and oats, although oats are not planned as a cash crop.

Fat Sheep Production

Fat sheep farms derive the greater part of the gross income from the sales of fat sheep and their by-products, including wool and skins. Sometimes these sales are almost the only source of income, but on the better land quite a considerable share of the income is often derived from the sale of cash crops, including cereals grown for grain or chaff, and seeds, especially pasture seeds. Such farms are located widely throughout the plains and arable downs and are little restricted by soil types or other circumstances. Some, for example, are on the light plains land between Rolleston and Springston, near Christchurch, and some are in the Seafield and Dromore districts in Ashburton County.

Other farms in this group are found toward the foothills, but nearer to the coast than the plains store sheep farms. In this situation the climate has milder temperatures and more sunshine than the plains store sheep country and the rainfall of about 35in. is much more favourable to grassland than the 25in. of the light plains land. There is therefore a decrease in the acreage of forage crops required annually. The carrying capacity is about 1¼ ewes an acre. Typical holdings vary from 600 to 1200 acres. Nearly all the income is from sales of fat stock and wool. Oats are grown chiefly for domestic use, and the main green forage crops are rape and turnips, which are used freely for fatten-



In 1944-45, 443,010 sheep, 1,965,644 lambs, 13,925 cattle, 37,554 pigs, 36,072 bobby calves, and 2202 other calves were slaughtered in Canterbury freezing works. Dominion freezing works totals for the same year were 3,105,782 sheep, 10,515,905 lambs, 374,225 cattle, 584,980 pigs, 902,539 bobby calves, and 20,653 other calves.

The quantity of bacon and ham produced in the province in 1944-45 was 30,455cwt., and 4894cwt. of pork was frozen.

The total quantity of butter produced in Canterbury in 1945-46 was 7,325,960lb., whey butter produced was 58,940lb., and cheese 4,669,540lb.

ing, which continues until May. Oats as chaff are used for feeding sheep in winter and for horses, although the latter have been widely replaced recently by tractors.

As the soils improve returns from crops form a greater proportion of the total income, and when the land is capable of producing wheat crops of 30 to 35 bushels an acre the returns from crops are likely to equal and perhaps exceed those from livestock. This situation is the borderline between fat sheep farms and mixed farms in which cash cropping is the chief feature. There are exceptions, however; for example, a farmer excelling in sheep husbandry and grassland management would concentrate on fattening, although in the normal practice the dominant feature might be cropping, and conversely a farmer excelling in crop husbandry, particularly small seed production, would obtain more return from crops than from fat stock.

Mixed Farming (Cash Cropping)

Farms devoted to mixed farming in which the growing of crops for sale is the dominant project are numerous and are spread widely throughout Canterbury. They are more common on the better soils, principally in the coastal belt and near the lower reaches of the rivers. Some are situated between Christchurch and Leeston, others are in the territory lying between Rakaia, Methven, and Ashburton, in the vicinity of Tinwald, and in the coastal belt in South Canterbury, especially in the Studholme-Willowbridge-Morven district.

Normally this land grows 35 or more bushels of wheat an acre. Generally on farms in this group the production of fat sheep is an important part of the work, but the greater part of the revenue comes from the sale of crops. Quite often wheat is the chief crop, particularly in the large Ashburton County, where about a quarter of the whole wheat crop of the Dominion is grown. Other crops which are prominent on these farms are oats, barley, peas, potatoes, and small seeds. The farms usually range from 250 to 400 acres. In addition to cash crops, forage crops such as turnips, rape, kales (important among which is the marrow-stem type known also as chou moellier), swedes, and mangolds are grown for feed for livestock during periods of pasture scarcity; the oats grown probably serve more as a fodder crop than as a cash crop.

Set cropping rotations are not followed and the cropping programmes on adjacent farms of similar soil type and size may differ considerably; the cropping programme on a particular holding may also vary substantially over a number of years, the supply of labour and the prices of different kinds of farm produce being important factors in the variation. As might be expected, the size of holdings tends to fall as the fertility of the land rises, and as the fertility increases arable farming is probably carried on more intensively and greater attention is given to such crops as potatoes, mangolds, and peas because these crops respond well to high fertility and also partly because peas assist in replacing fertility removed under fairly intensive cultivation. As a rule cash cropping is not pursued to such an extent that fertility will appreciably suffer over a cycle of years, but there are some instances where the number of arable crops produced over a series of years has been so great that the fertility of the soil has been considerably reduced.

Mixed Farming (Dairying)

Farms on which dairying is of chief importance are scattered throughout Canterbury, but are mainly in the coastal belt. Generally dairying is given prominence because of the wetter nature of the land, though some dairying is carried out on relatively-dry soils, or because of the relatively-small acreage of the holding, its location, or perhaps a combination of these circumstances. There is a good deal of dairying within a radius of 25 miles north and south of Christchurch for town milk supply, and dairying is carried out in the coastal belt immediately south of the Ashburton River, in the coastal belt north of Timaru, and in Banks Peninsula, where the climate is favourable, the rainfall being comparable with that in some of the North Island districts in which dairying is prominent. The details of production on mixed farms where dairying is the main occupation vary greatly. Quite often less cash crops such as wheat and peas are grown, and hay, pasture seeds, and potatoes are not infrequently direct sources of revenue; on the larger holdings returns from sheep may be considerable. This could be expected on holdings of about 300 acres, as in the Ashburton dairying belt, but even on holdings of about 100 acres of good land sheep may contribute an important part of the revenue. Pig production is carried out on most farms, but its part is often small. However, in some cases it is of importance, particularly on farms where skim-milk is available.

On the mixed farms of this group there is a tendency to give greater attention to growing mangolds, turnips, greenfeed crops, and hay than on the mixed farms which specialise in cash cropping.

[*"New Zealand Farmer" photo.*

Irrigation by wild flooding is likely to result in uneven watering. The watered portion on the left has a luxuriant growth of red clover, but the growth of the pasture on the right is poor because of insufficient water.

Specialised Dairy Farms

Throughout the province there are about 1250 farms with herds between 10 and 39 cows. About half of these herds contain from 10 to 19 cows and most of them are probably on holdings on which crops, sheep, or both provide substantial parts of the revenue. There are nearly 200 holdings on which the dairy herds contain 40 cows or more, and in this relatively-small group are most of the specialised dairy farms, which are the same as those which are prominent in other main dairying districts. These specialised dairy farms are to be found in the same districts as the mixed dairying farms.

Small Holdings

An important feature of Canterbury farming is the development of small holdings to a greater extent than in any other province in New Zealand; this is particularly noticeable near Christchurch. In the Heathcote, Waimairi, and Paparua Counties there are 2203 holdings, the average area of which is 49 acres, and there are also many small holdings in the nearby counties of Halswell and Rangiora.

The number of small holdings within 25 miles of Christchurch is probably about 3000. Most of them are on highly-fertile land and their production is very comprehensive and often intensive, including market gardening, poultry keeping, orchard production, small fruit growing, and dairying for town milk supply. Sometimes the work is very specialised; for example, some small holders grow only out-of-season crops in glasshouses (of which there are 850), rhubarb alone, or confine their activities to poultry keeping. Quite often there is little variety of crops, as at Marshland, where the land is devoted almost exclusively to onions and root crops, but in other districts there is considerable diversification such as dairying, market gardening, and poultry keeping on one holding, and orchard production, market gardening, and poultry keeping on another holding.

The nature of the labour supply is more varied than usual in primary production. On a number of holdings there are, of course, regular full-time workers, but many holdings provide part-time employment and a supplementary income to those who are regularly employed in shops, factories, offices, and public utilities. Another considerable section of holdings gives employment for part of the year to those who have a full-time seasonal occupation for the rest of the year—for example, workers in the four meat-freezing works in the district. Juvenile and other family labour also assist fairly extensively. Two factors in the creation of these Canterbury small holdings have been the provision of suitable transport facilities, which enable workers to live at considerable distances from their place of work, and the use of soils that are highly productive under suitable management.

Orchard production is an important project on Canterbury small holdings. Orchards totalling about 2000 acres have been established near all the main centres, where they meet local needs, but the production of the larger fruits is inadequate for the local market. The major commercial orchard areas are located (i) in the Rangiora district, especially at Loburn, where mainly pip fruit is grown; (ii) near Christchurch, especially in the Waimairi district, where pip fruit is the chief product but where berries also are important, and in the valleys round the Port Hills—for example, Heathcote and Governor's Bay—where stone fruits are produced for the early-season market, and (iii) at Waimate in South Canterbury, which has won a reputation for berry production.

Most of the market gardening is done in North Canterbury, where there are more than 634 market gardens totalling 2879 acres, excluding holdings producing onions and potatoes. Four hundred and eighty of the market gardens range from 1 to 15 acres in area. Produce is exported to Wellington, Dunedin, and the West Coast, and in recent years more than 1000 tons of tomatoes, cucumber, cauliflower, and cabbage a year have been supplied to processing factories for pickles and sauces.

Poultry keeping is efficiently carried out on an extensive commercial scale, mainly on small holdings. The relatively-low rainfall, abundant sunshine, and proximity to large-scale cereal production are factors in its success, and probably explain why about a third of the Dominion's large poultry flocks (1000 birds and over) are in Canterbury.

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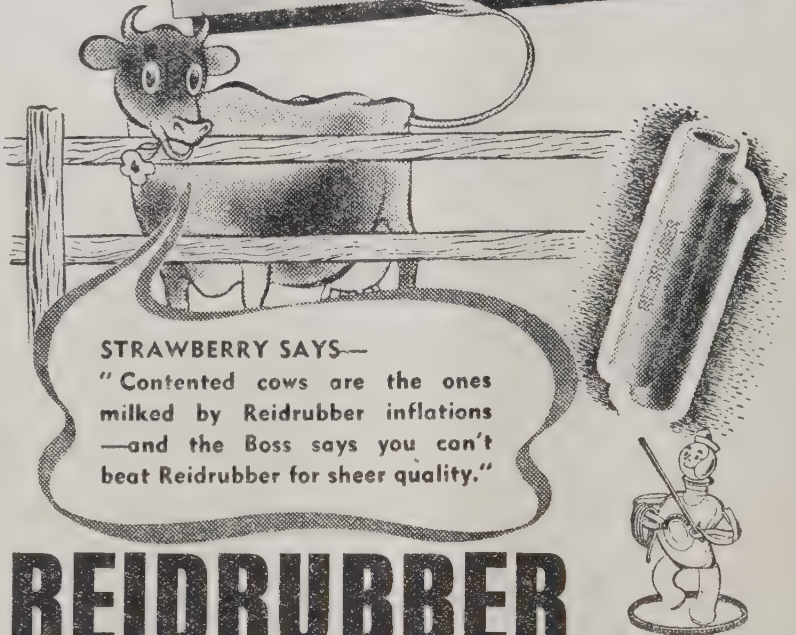

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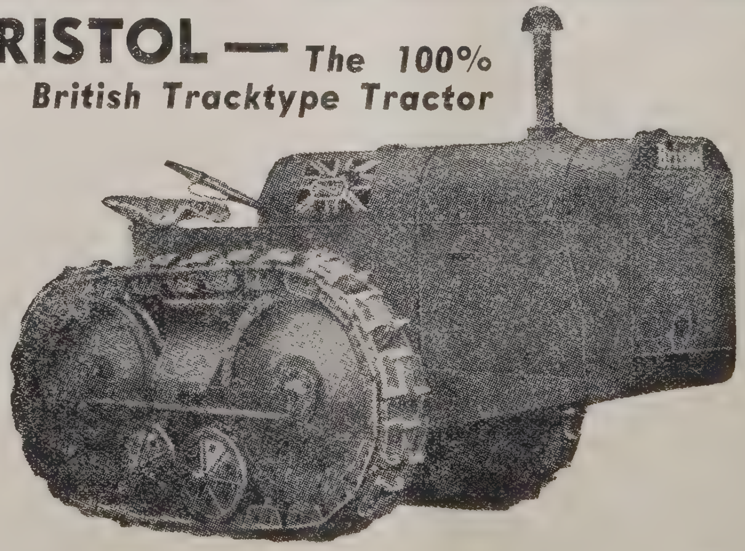

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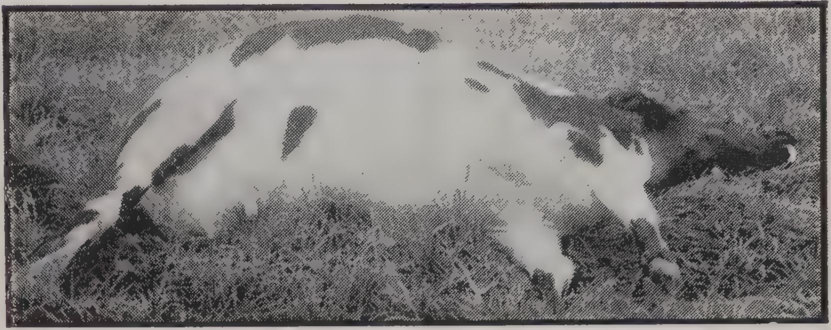

WITHOUT the beneficial association of clovers, grass does not thrive, and before high-producing, grassy pastures can be attained a period when clover is dominant in the sward must be passed. In this stage of pasture improvement bloat and feediness are common causes of distress, but there are several ways of alleviating these ills by modifications in pasture and herd management.

Making Pastures Safer

A clover-dominant pasture can be made more grassy by giving it long spells between lenient but rapid grazings from April to November and by carefully avoiding grazing it bare at any time during this period. Of course some clovery pastures contain no grasses at all or only poor strains of grasses, and there is no likelihood of producing much change in these by grazing management. Ryegrass of a good strain, cocksfoot, prairie grass, and Yorkshire fog will respond remarkably well to lenient winter grazing. Close and continuous winter grazing will increase the danger of both bloat and feediness in the spring.

Saved winter grass feed with lucerne hay or good clover hay is good, safe mature feed on which cows will milk well without much danger of bloat or feediness.

It should be realised, however, that pasturage which has been closed to stock for some considerable time is mature only for its first few hours of grazing, even if there is still six inches of herbage still to be grazed, for immediately some defoliation of a pasture plant takes place during periods of rapid growth, "transference growth" begins, and this is immature growth which is thought to cause both feedy cream and bloat in stock if grazed before it has had time to mature.

"Transference growth" is growth by a short cut, and as opposed to normal "active growth" it is the partial and almost immediate substitution of some of the leafage removed from a plant by transference to the damaged leaves of some of the stored nutrients in its roots and crown and not by the normal processes of leaf growth. It has that pale, yellowish appearance of the first quick growth on the stubble of mown green cereals or mown long grass well known to men of the field. It appears within a few hours of defoliation, but does not mature for several days. The time will vary with local conditions, being shorter when colder conditions prevail, but to be on the safe side the second grazing should be delayed for up to a week if possible.

If trouble is anticipated at these dangerous times of the year the herd should not be put into the same field after two successive milkings, but the grazing of a field for the second time should be delayed as long as possible. This necessitates many small fields, and for this purpose temporary subdivision may be conveniently arranged by using a single-wire electric fence. Where feed flavour and bloat are troublesome this method of combating them should be given a fair trial.

The sudden change of diet in the spring from the dry, fibrous hay which has formed the bulk of the ration of stock for many weeks to watery, lush pasturage is one of the chief causes of feediness and bloat, because the stomach is unprepared to meet so extreme a change in what it is required to digest. The change must be made as gradually as possible. Feeding good hay with lush pasturage tends to reduce digestive upsets. Molasses sprinkled on the hay encourages cows to eat it, and the cows should be fed the hay before they are put on to the lush pasture. Autumn-sown barley grazed for an hour before the cows go to pasture is excellent for preventing bloat and feed flavour. This is good practice to adopt after the evening milking, because of the difficulty of watching cows at night. At night, also, the safest pastures should be used.

Controlling the Grazing

Removing cows from dangerous pasturage four hours before the evening milking reduces feed flavour in the evening's cream but does not reduce butterfat production or bloat. It may even increase bloat during the night through the cows becoming extra hungry by the end of the evening's milking and then over-eating. Over-eating will not cause acute bloat under normal conditions, but is very dangerous during periods of rapid growth when the cows eat too much immature, protein-rich herbage. Then, besides getting blown up with gases formed through fermentation in the digestive process and retained through the cow's inability to belch them forth because involuntary muscles at the base of the gullet may keep the gullet closed through "protein shock," the cow also suffers and may die from absorption of some of these gases which are actually toxic. The dairy farmer must therefore be very careful with his control of the grazing during periods of rapid growth. It will profit him little to reduce feed flavour if by doing so he should increase bloat. Many farmers have successfully reduced feed flavour by this method of controlling the grazing without causing the herd to suffer from bloat, and there is no reason why many more should not do likewise provided they are aware of the possibility of bloat and watch the cows.

To reduce the incidence of bloat by controlled grazing cows should be removed immediately there is the least sign of blowing in any cow, if not before. This can occur within a quarter of an hour, particularly if the pasturage is wet and the sun shining strongly. Constant and careful watching is necessary right up to and after this stage has been reached. Cows most prone to blowing should be most carefully watched and used as indicators for the whole herd. When a danger signal is observed the whole herd should at once be moved into a safe area, usually the concrete holding yard, and those showing symptoms of bloat should be drenched.

A good drench for bloat is 2oz. of oil of turpentine in one pint of raw linseed oil. Four tablespoons equal two fluid ounces. Sodium bicarbonate or baking soda is also effective in treating some forms of indigestion; the dose for cattle is ½ to 2oz., but a quarter of a pound dissolved in a quart of cold water is usually given for bloat and repeated if necessary.

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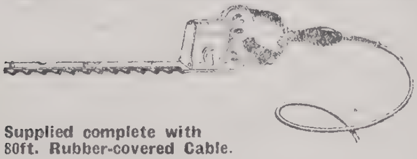

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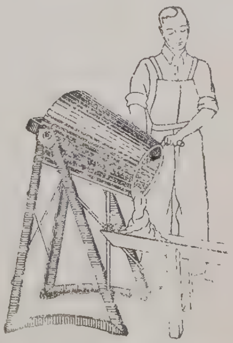

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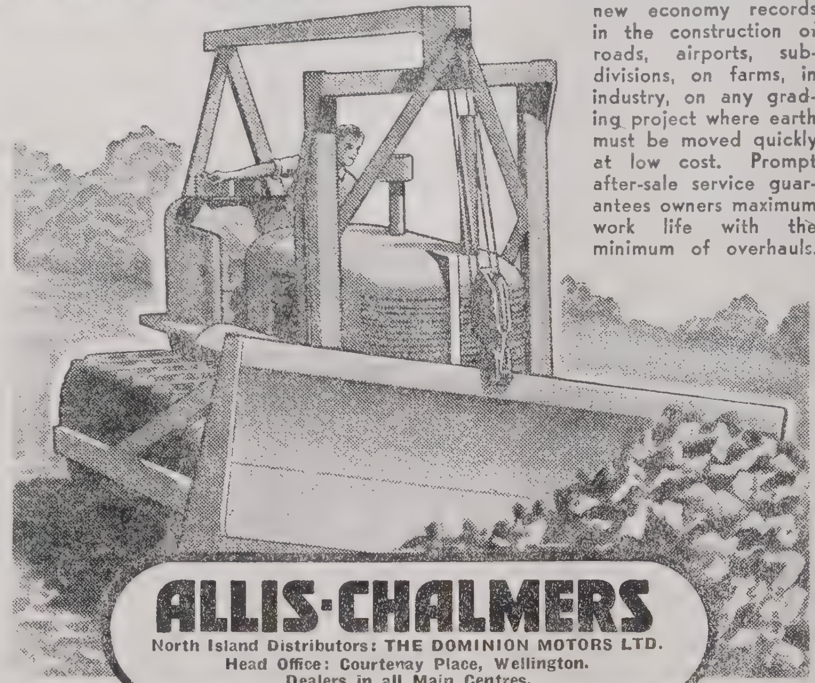

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Rapid Shelter from Minor Species of Trees

By M. SUTHERLAND, *Farm Forestry Officer, Rural Development Division, Wellington.*

ARTICLES on planting homestead shelter in the March, June, and August issues of the "Journal" have dealt chiefly with the formation of high shelter belts designed to produce effect over a maximum area of land around the home enclosure, and the trees considered for that purpose have in the main been introduced species. However, there are ways of obtaining good shelter around the homestead or on the farm without waiting for the growth of tall trees, and this article describes the use of some minor species in the formation of quick-growing shelter.

THE general use of exotic pines for shelter has been the result of the necessity for speed and ease of establishment of trees to be used for protection, and both these attributes are obtained more readily with the commonly-planted exotic species than with most native species. *Pinus radiata* fulfils those needs admirably in early years and adapts itself to most conditions in New Zealand, but it is now recognised that there are limitations to the use of the common pines and that more choice is available in type of shelter and species which can be grown under various conditions.

Ways of Using Minor Species

Minor species of trees or shrubs can be employed to form single-type shelter breaks of medium height, for which both native and exotic species may be used. Such species may also be used in shelter plans in which a temporary quick-growing belt is formed for shelter while the permanent high-shelter trees are growing up in its lee. Minor species are particularly valuable as nurse trees to protect slower, more tender trees which can be planted in association with them.

In remote, exposed places, where establishment of shelter is difficult, existing tree or shrub vegetation may often be used for protection at first, and by careful training or trimming an effective shelter belt or hedge can be formed from most unlikely material—for example, manuka. Such a protection may be merely temporary and not as effective as well-planned shelter but in many newly-formed homes in these times of material and labour shortages expediency and improvisation of material near at hand are necessary to obtain speedy relief from wind and weather. Such means may be found among both native and introduced types of vegetation.

NATIVE SPECIES

New Zealand Flax

A valuable and widely-occurring native species is the ubiquitous native flax (*Phormium tenax*), which is found in practically every region of New Zealand. Certain conditions are most suited for its development—for example, deep, swamp soil with the water table a few feet below ground level—whereas in dry, shallow soil it remains undersized and unthrifty, but flax may be relied on to produce ordinary, good growth on all types of land used for farming.

On many farms are places where usual shelter species are hard to grow because of wet soil conditions, dry and stony ground, or erratic frosts, and in such areas one of the easiest plants to establish is the native flax.

It grows by the successive formation of flat "fans" of long, strap leaves, the bases of which are tightly folded on each other to make a firm shaft springing from the swollen, horizontal, underground stem, while the stiff blades spread out or interlace to form a semi-penetrable screen which breaks up air currents and deflects wind upward. Closely-growing flax can be used as a hedge for homestead shelter or for farm subdivision and will persist almost indefinitely, but it is also of great value as a temporary barrier within which permanent trees can be planted, in which case care must be taken that sufficient growing space is allowed; at least 8ft. should be left between the line of flax and the new trees.

Growth Characteristics

When planted as a belt flax will produce effective shelter in about four years, eventually forming a screen 10 to 12ft. high. It is indifferent to salt winds and will grow in pure sand, so that it can form valuable shelter on coastal land. Stock will chew the young leaves, so it is necessary to protect the line of bushes by fencing, at least on the side open to stock; planting along a drain or just below the ridge on a steep face will save one fencing line. Browsing cannot kill out the flax, but heavy browsing will reduce its value as shelter and produce an ugly appearance.

No trimming or thinning is required for several years after planting, but after 10 or 12 years the bushes may have spread extensively toward the fence and require to be dug out. This spread is a disadvantage where bushes are used as shelter clumps around the homestead, and great difficulty is often experienced in removing them because of the long, strong roots which may

FLAX AS FARM SHELTER

Flax can be grown on waste places on the farm where shelter trees are difficult to establish.

go down 10ft. toward underground water. Vigorously-growing flax will overtop other growth, but for a successful shelter belt and to prevent the spread of weeds the clumps should be kept clear of heavy grass growth, which in time appears to weaken the stand; that is most easily done if the bottom fencing wire is left off to allow grazing by sheep or pigs.

Will not Thrive in Shade

Though flax may be useful for shelter in many difficult situations, it will not thrive in full shade under trees, especially in competition with tree roots where the soil is poor and dry, so it is seldom of use as undershelter to renovate old pine belts which have opened up below. Where no other species is available, it may be possible to use it for this puropse under certain conditions in high-rainfall areas if the ground can first be broken up well along a strip on the sunny side of the pines and at least 10ft. from the tree stems, so that the flax will escape competition with the dense root system of the trees.

However, an excellent plan in the formation of a quick shelter belt is to use flax in combination with some light-foliaged, deciduous trees such as Lombardy poplar or silver birch, or with secondary native trees such as lacebarks. The flax can be planted as one line, and the trees, widely spaced at about 10ft., planted later as a back line about 4ft. away. Equally well, if planted at the same time, trees may be spaced through the flax line at fixed intervals and will grow above the solid basal flax screen, providing a higher line of wind deflection.

Easily Established

To obtain rapid first shelter in places where tree establishment is difficult, flax has the merits of speed and ease in establishment. Plants can be established most simply by cutting off and transplanting small portions of an older bush; these consist of small blocks of the thick, underground stem, 2 or 3in. square and bearing two or three small young fans, each of which before planting out should be trimmed into a wedge shape, leaving the inner and younger leaves about 2ft. long, with edge leaves cut down to 12 or 18in.

Dr. J. S. Yeates, Lecturer in Agricultural Botany at Massey College, states that quicker growth is obtained by planting out seedling flax rather than fans from old bushes. These should be two-year seedlings, well grown and about 2ft. high, bearing several leaves, which should be cut back to 1ft. long before planting. These seedlings may be found growing in the vicinity of old bushes or can be raised in a garden bed from seed collected from a good type of shelter bush. Care should be taken to propagate only from tall-growing plants, with upward rather than drooping leaf growth, and from sparsely-flowering clumps, which maintain a denser leaf production. Where local shelter is required only for sheep or piggeries, the drooping-leaved forms may provide more shade.

To form a good flax belt seedlings or fans should be planted out in one line about 3ft. apart in clean, cultivated ground, or as alternate lines with 5ft. between lines and plants and the same distance from the fence. Under ordinary conditions a satisfactory shelter will be obtained in about four years after planting, forming a screen 5 to 6ft. high which with age will increase in density and height.

As well as its shelter value when used as a belt, clumps of flax are useful in the initial planting of farmhouse environs to break the force of wind on corners, but care should be taken to plant the original fan at least 4ft. from any building, as it will increase rapidly in size and ultimately its proximity to the corner will make its removal, when it is no longer required, still more difficult.

Ngaio

Another indigenous minor species which makes excellent shelter in certain positions is the ngaio (*Myoporum laetum*), which is easily grown and fairly rapidly reaches the dimensions of a small tree bearing a rounded crown of wide, spreading branches at any height up to about 15ft. Used as a single line of trees planted 5ft. apart, with the crowns eventually just touching, ngaios form an attractive shelter belt, or they may be planted more closely, 2 to 3ft. apart, and side trimmed from early days to form a hedge.

The New Zealand ngaio grows best under coastal conditions, occurring from one end of the Dominion to the other, but as a quick shelter tree it has now been superseded largely by the Tasmanian species (*Myoporum insulare*), which is more rapid in growth and more adaptable to inland conditions. The introduced species may be distinguished by its dark green, serrated-edged leaves, the New Zealand ngaio having light green, smooth-edged leaves.

Both species favour sandy soil or pure coastal sand, but Tasmanian ngaio will flourish on inland loams and the native species thrives also on poor, dry clay loam of the greywacke rotten rock formation; both grow badly on wet soil. These species are impervious to salt winds, the foliage remaining green and fresh after heavy and persistent gales. However, if they are grown in clay soils, and the crown is left untrimmed to form a top-heavy tree, after heavy rain ngaios may blow over, their root systems pulling up the ground in the vicinity though the roots remain firmly embedded in the soil; if the trunk is left lying, it gives off vertical branches which grow up thickly to re-form the wind screen.

Flax forms an effective wind screen.

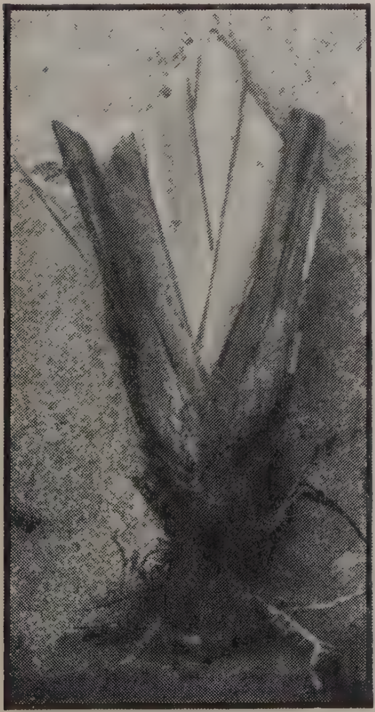
As is usual with coastal species, the young tips of ngaio branches may become damaged by frosts of 8 to 10 degrees, especially when growing inland, but recovery is rapid and new foliage is produced in a few weeks.

Growth Form

When left to grow naturally ngaio trees become heavily branched and somewhat open, so that some trimming is necessary to create a good shelter screen. Trimming is best started in the first year when the trees are 18 to 24in. high by lightly cutting back the lower branch tips; that stimulates the growth of more side branches if carried out twice or thrice during the first two seasons. The plant may then be left to develop its top growth naturally.

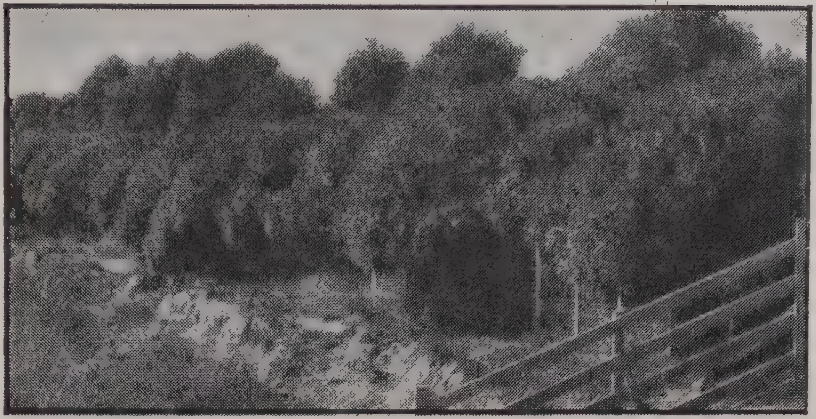
In suitable localities of both islands Tasmanian ngaio is one of the best subsidiary trees to produce rapid shelter around a bare home. It will form shelter 4 to 6ft. high in two years and grow into a tree of average height up to 15 or 20ft. with a spread of 12ft. in about six years. It can also form a satisfactory hedge 12 to 15ft. high which, by hard trimming every six or eight years after establishment, can be kept to a thickness of 4 or 5ft.

A most useful quality of ngaio as a shelter species is its tenacity of life; it may be cut back hard to wood 1 or 2in. thick and in a few weeks it will put forth strong, green growth which in time forms woody branches as before. Trimmed hedges of 20 years' growth are known, but at that age they tend to become rough and rather open.



A young flax cutting from an old fan, trimmed ready for planting out.

MINOR SHELTER SPECIES



Tasmanian ngaio forming the outer shelter line to eucalyptus trees grown in an alternating row.

Stock are not partial to either species of ngaio when they have plenty of feed and apparently no harm comes to them from chewing occasional fresh leaves from a hedge, but where branches have been blown down in a gale when little feed was available in the paddocks animals have been fatally poisoned by eating the leaves. Therefore it is important to keep stock out of paddocks bordered by ngaio until branches have been cleared away after storms, and ngaio hedge trimmings should always be burnt. Plants should be protected from browsing by placing a fence well away from the trees while the foliage is still low.

Seedlings and Cuttings

Both species of ngaio are most easily grown from seed. Natural seedlings are often found around openly-grown trees, and they can be lifted and transplanted in the garden for a year to increase the root system before being used for shelter belts. If seed is sown soon after it ripens in July on fine soil and lightly covered, seedlings may be ready to plant out the following winter.

For farmers who will take the time and trouble, cuttings may be grown by removing about 5in. of the growing tips of branches; all leaves but the top three are stripped off and the stem inserted in sandy soil except for about 1in. at the tip. The cuttings must be sheltered from the sun by scrim or branches and kept moist until they root in a month or two.

Growing from cuttings is uncertain, but an easier method is to take cuttings about 9in. long in summer from mature wood of pencil thickness, place them slanting in a trench 8in. deep so that only about 1in. is left above ground, firm the soil against the stems, and keep them moist and sheltered. These should be rooted and grown sufficiently to be transplanted late in the following winter.

Whether grown on the farm or bought in as rooted cuttings or plants, ngaio stock should be planted as soon as it is taken out of the ground and must never be allowed to dry. Even after planting it is wise to water them for the first few weeks.

EXOTIC SPECIES

Pampas Grass

In areas where it grows successfully pampas grass (*Cortaderia selloana*) has been evolved in recent years as a useful dual-purpose farm crop. In the North Island and northern parts of the South Island the value of pampas as winter stock feed is recognised and the crop has been grown as standard practice in many districts, but in recent years not so much prominence has been given it as an aid to the rapid production of shelter on the farm. In Auckland Province pampas was first used for shelter or ornament, and from the partiality for it shown by stock arose the recognition of its possibility for use as feed. If follows that when used as shelter pampas grass must be securely fenced off from stock, though it can withstand the damage and renew easily the growth lost by being eaten off.

Another advantage is its rapid growth. In three years it will provide a dense shelter hedge up to 6ft. high, and even when eaten down in one winter's grazing it will regrow up to 7 or 8ft. during the next few months. An average height of 12ft. is attained by the grass, but how long plants of that size will keep their density is not known.

Additional qualities are its adaptability to many soils and climates and its ease of establishment if correct

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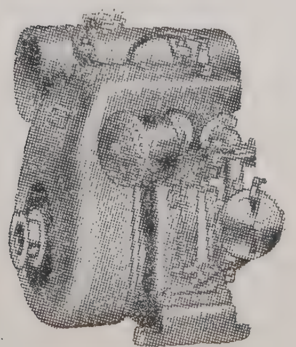

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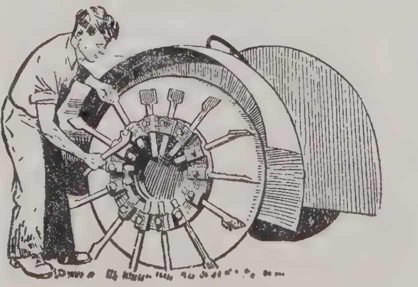

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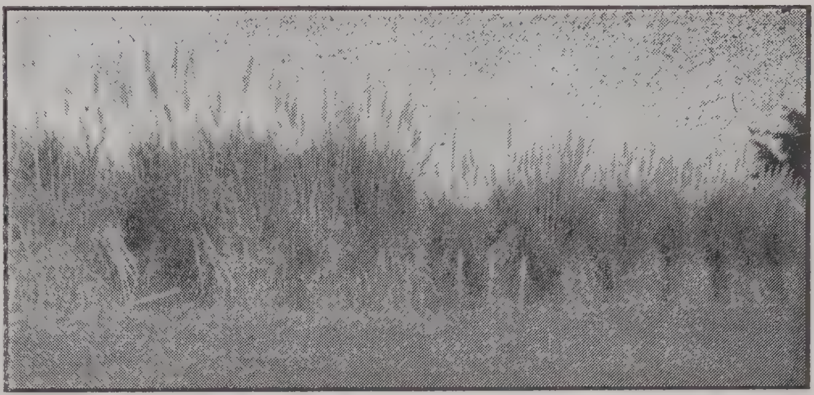
methods are followed. Though for best growth it should be planted on fertile, well-drained soil, it can be grown on pumice land, on light clay, on some sandy and peaty soils, and on hillsides, but will not succeed on waste or weedy land without cultivation; having a long rooting system it can penetrate to a deep water table. The best production as fodder occurs in the warmer parts of the country, but the plant will grow sufficiently as shelter in all but the higher and coldest parts, and apparently is not influenced by frost when mature or by salt sea winds.

Shelter and Grazing

For advantage to be taken of the double-purpose crop, its use as fodder must be well regulated by the farmer and the crop must be in a position which will afford shelter to stock or to the homestead—for example, a pampas belt can be planted along a home paddock margin in a position to shelter the house from cold winds and at the same time be available for emergency feeding for the stock. Though the two purposes are compatible, pampas used for house shelter must not be grazed so heavily or constantly that growth is reduced sufficiently to become ineffective; its value must lie in short periodic winter grazing or supplementary feeding in times of drought.



Pampas grass grown as a shelter belt.

A well-rooted pampas plant ready to be planted in a shelter belt.

For stock shelter the same limits need not apply, as it is only toward the end of severe eating down when clumps are low that the grazing stock are bereft of the shelter. That can be remedied by having alternative belts placed strategically for successive grazing.

It is characteristic of pampas that when the flowering heads are left on the plant the centre of the clump gradually dies out. That can be prevented by allowing stock to graze in the belt for a short while when the flowering heads are young—about February—when they will eat the heads in preference to the leaves.

The crop should not be grazed until the second year after planting, by which time it is established effectively as shelter, and after that a controlled grazing to eat down weeds and prevent the accumulation of old growth should be carried out annually by opening a fence and allowing cattle to feed daily over a period. Plantations of pampas should be kept free of rank grass and weeds, which is most easily done in mature crops by allowing young sheep access to clean up growth between the clumps.

Objections have been raised to growing pampas near the homestead, as the large clumps may furnish shelter for vermin.

Propagation

Pampas grass belts can be formed by transplanting rooted sections directly from existing plants, but the safest method of establishment is either by seedlings, bought in or raised in a farm nursery, which have been lined out for a year, or by rooted cuttings which have been obtained by first breaking up mature plants into sections for propagation. These sections are lined out and cultivated in the garden nursery for a year, after which they are again broken up and the rooted parts planted out permanently.

Ground to receive pampas plants should be well cultivated beforehand, and the plants placed 6 to 8ft. apart, according to the quality of the site, and 7 to 8ft. from the fence. For successful establishment planting should be done in spring after late frosts and the area should be kept well cultivated for the first two years.

As a homestead shelter belt pampas has an attractive appearance and, if grazed intermittently, will preserve its strength and appearance. Clumps have been known to persist for 20 years, though it should be regarded as a more temporary shelter.

In a mixed belt planted with a eucalyptus species or with deciduous trees such as English ash or oak it will act as a rapid under-shelter, but the trees must either be planted two or three seasons ahead of the pampas, so that they get beyond grazing damage, or be large saplings when planted. Alternatively, such a mixed belt can be placed along a drain, but that may cause difficulty in grazing.

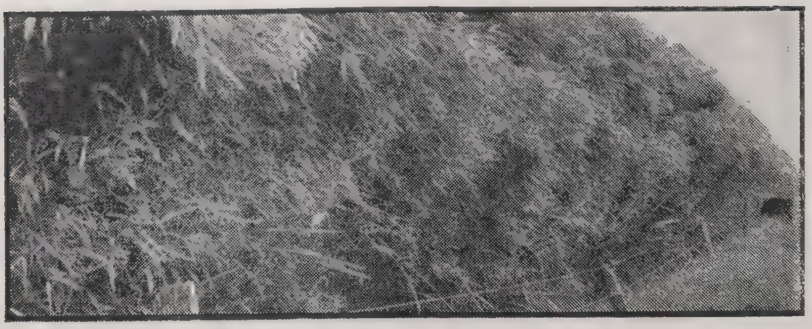
Detailed information about the growth and use of pampas grass is to be found in past numbers of the "Journal of Agriculture," especially useful information about shelter being that in the August, 1940, issue, page 93.

Bamboos

A similar type of shelter plant is the small-leaved bamboo (*Arundinaria macro sperma*), which grows easily in the warmer regions of the North Island and can be grown in all but the driest and most frosty parts of the South Island. It is especially useful for wet areas such as drained swamps and river-silt flats which are unsuitable for the usual shelter trees or hedge species, but it is also adaptable to many types of soil and to flat or hilly areas.

Many kinds of bamboo are growing in New Zealand, but the most common one is the most suitable for shelter. This plant when fully grown reaches a height of 15 to 20ft. and a mature

EXOTIC MINOR SHELTER SPECIES



Bamboo shelter planted along a drain.

belt consists of many closely-grown, ½in. stems which make a shelter impenetrable to wind and stock. However, stock damage it by chewing, so it is necessary to fence off the area to be planted. In drained areas a belt can be planted along the lee side of the drain, with the bounding fence 9 or 10ft. from the drain. It withstands salt winds and is thus of value in coastal areas as an outside line for house protection, allowing tall trees and shrubs to be raised under its shelter as shown in the photograph at the head of this article. As it is fairly tolerant of shade, it will persist if necessary as under-shelter when nearby trees grow up.

Control of Suckering

Bamboo requires no trimming, as the leaves are carried up on a clean stalk, but it suckers very freely and spreads quickly if unchecked. Where it adjoins grazing land the spread is kept down by stock eating off the young shoots as they come near the fence, but where it abuts on garden land bamboo may become a nuisance. In such cases the spread may be kept in check by digging a ditch 18 to 24in. wide and up to 3ft. deep on the garden side. Another disadvantage of this species is the difficulty of eradicating a heavy growth.

Bamboo is easily established by planting out rooted younger shoots of old plants. Pieces of the clump 2 or 3in. square bearing three or four shoots are cut off with a sharp spade, the tops trimmed down to 18 or 24in. and these sets are planted, preferably in cultivated land, about 2ft. apart and at least 4ft. from the fence. Rank grass should not be allowed near bamboo, hence the necessity for first cultivating the ground to be planted. If that is done, in favourable soil a hedge will grow to a height of 5 or 6ft. in the first two years and provide a continuous shelter screen. Bamboo hedges exist which have remained effective for 20 years.

An added virtue around homestead areas is their ability to provide so dense a cover that weeds such as blackberry and fern are unable to exist under the shade.

Tree Lucerne

Perhaps the most useful of all the minor species to grow for shelter is the tree lucerne (*Cytisus proliferus*), known also as tagasaste. It has been introduced in recent years from the Canary Islands, and in a short time has firmly established itself in milder parts.

It may correctly be termed "the farmer's friend," as its uses are so varied that it can provide medium-height shelter belts, hedges, bee-food, firewood, and soil improvement, without any indication of its becoming a harmful weed.

Tree lucerne is very accommodating in its demands on conditions of growth; it occurs freely on coastal and inland areas throughout the North Island and, though at present it is growing only in scattered areas of the South Island, there appears no reason why it should not be adopted more widely for temporary shelter.

The value of tagasaste lies chiefly in its adaptability to poor conditions where other shrubs and trees find difficulty in maintaining growth and in its prolific growth in poor soil. Under such conditions, where the planting of *Pinus radiata* is usually resorted to, tree lucerne will grow more rapidly than pines in the first three or four years and produce better shelter. It flourishes in sand, but grows almost equally well in poor clay loams; it seldom grows in wet, sour areas or in very rich land, but is invaluable on dry, thin, and exposed soils. It is suited to most climates in New Zealand and withstands considerable degrees of frost and cold, but in areas of heavy rainfall it is not necessary to use it because better, permanent species can usually be grown.

Rapid growth occurs in plants from the seedling stage, and in two years they will give shelter about 6ft. high; if left to develop naturally, this species will ultimately form small trees 25 to 30ft. high. Tree lucerne grows prolifically, forming a spreading, lightly-branched, bushy head, and when grown sufficiently closely—say 4 or 5ft. apart in a single line—it will form an effective shelter screen, but it tends to open up at the foot, so that to preserve the leafy barrier to the ground it is necessary to trim the lower regions of the plant from early growth. When the trees are about a foot high the tips should be cut back for 2 or 3in. and a succession of side trimmings should be carried out during the growing season—five or six times in the first year—to produce a solid base. That may appear to involve frequent labour, but the soft growth can be trimmed extremely easily and rapidly with shears if done lightly and often, and the trouble involved is well repaid.

Adaptable Growth

Grown in a single line with the inner border trimmed up to 5ft., tree lucerne forms an excellent first shelter around the farmhouse, especially if the belt is placed along a ridge where shelter is difficult to establish and where the rapid height growth is effective in deflecting prevailing winds upward over the house. If the trees are planted just below the crest of the ridge, it is possible to dispense with the basal thickening up process because the bank stops any draught, though it is better to trim the inner branch growth for the sake of appearance from the house.

Treated as an ordinary hedge plant, tree lucerne will form a compact, evergreen, easily-trimmed and effective shelter. For that purpose plants should be grown 18 to 24in. apart and trimmed from early growth—regularly and frequently during the first two years, after which trimming is required only two or three times a year during the growing season. The top may be left to grow unchecked or levelled off when the required height is reached.

Hedges, which become twiggy and dense, can with care be kept down to a width of about 2ft. Tree lucerne maintains its rapid growth throughout its life, but that is short, and at 10 or 12 years trees may be expected to die off, sometimes assisted by attack by a borer, which is not harmful to house timber.

Use as a Nurse Tree

Because of its short life and light branching habit and foliage, tree lucerne is perhaps the most suitable species for use as a temporary shelter to act as nurse in raising permanent shelter of valuable and less hardy species. In this way a lucerne belt can be grown rapidly where shelter is required, and after a year or so trees which are sensitive to wind in their early years, or which require cover from frost, may be planted in its lee.

USES OF TREE LUCERNE

Tree lucerne used for temporary shelter while new trees are being grown to replace wind-damaged eucalypts.

For such purposes the permanent crop may be planted as an inner row 3 or 4ft. from the lucerne row and the over-topping branches of lucerne lopped off as required, or frost-sensitive permanent trees may be interplanted among scattered lucerne plants, the light foliage of which admits sufficient light but acts as a screen in frosty weather. Most permanent species become established by 12 years, after which the lucerne either gradually dies out or can be cut out, the wood providing very useful firewood, even when green. It can be removed with little trouble, in contrast to *Pinus radiata*, which until recently has been generally used in such cases to provide quick shelter but which rapidly grows out of control, often becoming a menace to the house and requiring expensive measures to remove.

Pines give little back to the soil, but tree lucerne, being a leguminous species, carries nitrifying nodules on the roots, and as well as being able to utilise nitrogen from the air it leaves poor soil on which it has been growing with improved humus and nitrogen content.

Tree lucerne has an attractive appearance of drooping, spreading branches with soft, light green foliage and masses of white, fragrant flowers blossoming in very early spring and providing the first early food for bees. It seeds prolifically on to nearby areas, and thus many belts of lucerne thicken themselves by continual replacement, but it does not become a menace to surrounding land, as seedling growth is easily eradicated, and if eaten by stock it is harmless.

A tree lucerne shelter belt trimmed up below to improve its density and appearance.

The disadvantages of this species as shelter are its purely temporary nature—it is more suited to house hedges or temporary shelter belts than to farm hedging—and its open-growing habit, which requires that it be trimmed often to preserve its density and, where grown as a "nurse," to prevent excessive spread of its branches over the permanent species which it is protecting. Tree lucerne is attractive to stock, and belts or hedges must be effectively protected by fences to prevent animals reaching over to browse on young plants, though later sufficient clipping may be attained by allowing stock to browse it at the extremity of their reach.

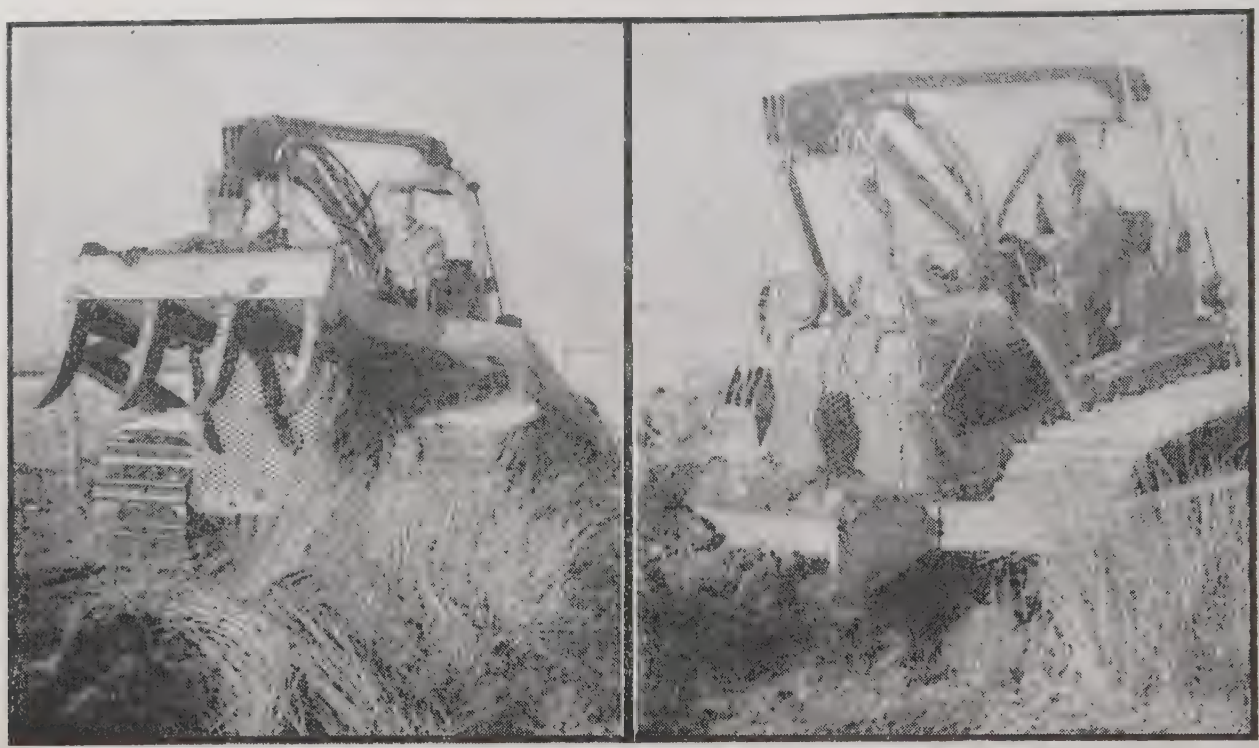
Ease of Establishment

Tree lucerne is easily established, either by planting out one-year trees which have been well rooted in a nursery—though care should be taken to do that in damp weather, as the plants wilt easily and dry off—or, with almost as rapid results, by sowing fresh seed where the shelter is required. The ground should be worked over and the seeds sown about every 6in., pressed into the soil, and lightly covered. When germination is well advanced the seedlings may be thinned to about 18in. and the spare ones used in gaps.

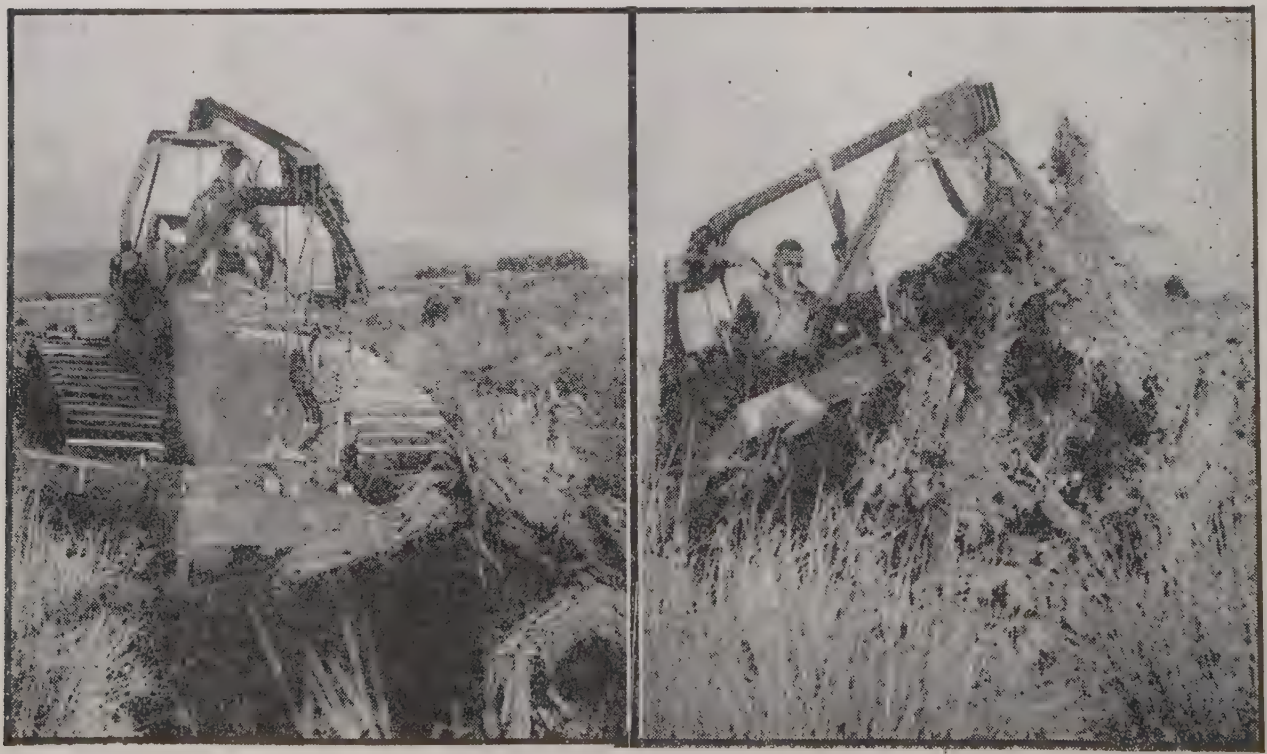
Wild seedlings, which are to be found near old trees in summer and autumn, can be used to form new belts. When not over 6in. high they should either be lifted and immediately lined out in a nursery bed to form better roots before being planted permanently after two or three months, or they should be wrenched on the spot and removed for planting as required or dug up with a small block of soil attached and replanted immediately.

Seed ripens in April and May and should be sown when fresh in August or September. If seed is old, it should have boiling water poured over it and be left overnight, then spread to dry or mixed with sand before being sown.

A MECHANICAL TRACTOR STUMPER AT WORK

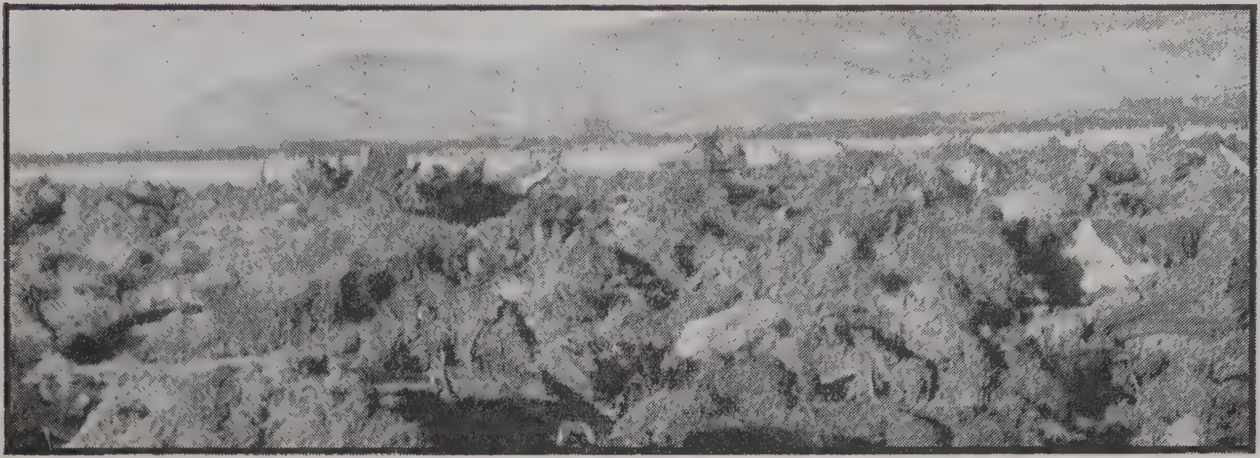


Left—Built specially for the job, the mechanical stumper is ready for work. Right—The heavy steel teeth dropped behind a hidden stump.



Left—A push and a lift start the stump moving. Right—With the power of the tractor properly applied the stump comes up with a minimum of earth.

Tractor Equipment for Stumping Swampland



Opiki Swamp in the Manawatu—a sea of uprooted stumps and a fearsome task to attack by hand.

By C. J. HAMBLYN, *Fields Superintendent, Palmerston North.*

THE removal of stumps and roots of forest trees which covered many thousands of acres of the swamp and river-silt lands of the North Island has been a major problem in the development of these otherwise fertile areas. A great deal of labour, explosives, horse work, and tractor hours has been expended at high cost in removing vast quantities of roots and stumps preparatory to the ploughing of the land for crops and the laying down of pastures.

ON much of the land the stumps were clear of the soil, only the roots being embedded in the surface. Such areas were comparatively easy to clear and were naturally tackled first, with various aids in the way of mechanical stumpers to help in the heavy hand work required. There are still many thousands of acres of peat and silt lands on such swamps as the Hikurangi in North Auckland, parts of the vast peat swamps of the Waikato and Hauraki Plains, on the Rangitaiki plains in the Bay of Plenty, and in the extensive areas of peaty swamp soils of the lower Manawatu, where the tree stumps are embedded in the soil and show at the surface only after the consolidation and sinking of the surface level which follow drainage.

The clearing of the deeply-embedded tree stumps from these lands has been a major problem in their development, as the stumps have to be literally lifted out of the ground and are often so numerous that little of the original surface is intact when stumping is completed. Slow and costly progress in this work has been made in the past by hand work, aided by much blasting powder and gelignite. There were seldom any suitable anchor stumps or trees on the areas which could be used as the base of operations for the usual hand- or horse-operated mechanical stumpers, which were found useful in ordinary stumping, and that type of implement could not be used. It was not until the heavier types of tractor became available and the giant hook for pulling up the stumps was developed that much real progress was made. Even with one of these heavy hooks and three men on the job the work was relatively slow and has become increasingly costly in recent years.

A recent further development in the Manawatu in harnessing a heavy tractor to the work of stumping and clearing land where the bulk of the stumps are below ground level should be of interest to farmers with areas still to be cleared. The co-operation of two local contractors engaged in swampland development with a blacksmith who has for many years been instrumental in providing the type of equipment required for such work, including giant swamp ploughs, ground levellers, and stumping hooks, has resulted in the fitting to their tractors of the special stumping tool illustrated in this article.

Cost of Work Reduced

This equipment has been found to do an excellent job in the most heavily stump-infested land, and costs, which have been steadily mounting during the past few years, have been reduced to such an extent that the clearing of land is proceeding much more rapidly than at any stage in the past history of these swamps. Really heavy stumping, where the tractor is straddling stumps while taking others out, is being done for £5 to £6 an acre.

Though the heavy bulldozer blade has been used successfully on some areas for similar work, it is claimed for this new machine that a cleaner and quicker job is done, leaving much smaller holes to be filled in and most of the soil usually removed with the stump either in or near the hole. The full power of the tractor is applied directly to the job, the action of the stumper being both a lift and a push, which is necessary in tackling stumps fully embedded in the ground.

The boggy nature of parts of the land over which these tractors work prevents the use of really heavy tractors and equipment, and the stumpers have been fitted to tractors in the 30 to 40 horsepower range. That limits to some extent the weight and size of the stumps which can be handled without recourse to breaking them up into pieces. However the stumper can do that with little trouble by starting operations on a wing of the stump. Stumps of between two and three tons are easily taken out in one operation.

The rapid progress being made with the clearing of land in the Makerua and Moutoa swamps along the Manawatu River by the two machines so far fitted with the special stumper indicates that such machines would be welcomed in some of the other swamplands, where the slowness and cost of getting the heavily-embedded stumps out of the ground are still delaying ploughing, levelling, and better pasture establishment.

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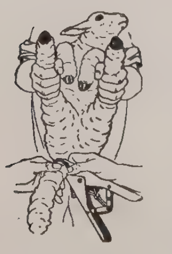
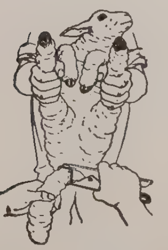


Placing ring on tail



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Loss Caused by Wool-branding Fluids which Will Not Scour Out

By J. E. DUNCAN, *Wool Supervisor, Wellington.*

WHEN or by whom the first identification mark was placed on a sheep is not known, but it must have been a long time ago. Even in New Zealand farmers have been branding their sheep for generations, using various methods and a diversity of substances. In the early days of provincial government there were already Acts and Ordinances governing the branding of sheep and other livestock, and they were consolidated in the Brands and Branding Act 1880, which is the basis of the present branding regulations incorporated in the Stock Act.

IN the early days branding was used, as it is today, as an easy means of identification of ownership and to some extent as a deterrent to sheep stealing. Branding has always been a "double-barrelled" provision which includes both the actual brand or wool-mark, and an ear-mark in addition.

Provision was also made for an alternative to the wool-mark in the form of a fire brand on horn or cheek, or an ear-tag or tattoo, and many people appear to be unaware that these alternatives are still perfectly legal.

It is logical to assume that by a process of trial and error the most durable materials were selected for the wool-mark or brand, and the 1880 Act stipulated pitch, tar, paint, raddle, or lampblack mixed with oil or tallow. These materials would all withstand the weather, but most of them could not be scoured out of the wool later. This did not worry the sheepfarmers, however, and, with the wide interval in space and time separating them from the purchasers and users of their wool, it is doubtful if many complaints about unscourable brands got the length of the Colony.

Provisions of Stock Act

At present the whole topic of branding is governed by the Stock Act (1908) and its amendments. The Act makes it plain that, with the exception of certain districts, branding of sheep is compulsory and a fine is provided for failure to brand.

Summarising, the main provisions of the Act concerning wool branding are as follows (the numbers refer to sections of the Act):—

61. **Interpretation:** "Brand" means, in the case of sheep, a wool-mark **made with an approved wool-marking preparation,** used in conjunction with any one of the following: (i) an earmark; (ii) a metal ear-tag; (iii) a tattoo mark on any part of the skin; (iv) a fire mark on the horn or face.

62. **When Sheep and Lambs to be Branded:** "All sheep forthwith after shearing, and all lambs before the thirtieth day of April in each year, shall be distinctly and legibly branded with the registered brand of the owner; and for every such sheep not so branded the owner thereof shall be liable to a fine not exceeding ten shillings." Certain districts are already exempt from wool branding and the Governor-General "shall exempt any other district from wool branding on the petition of the majority of the owners of sheep in such district."

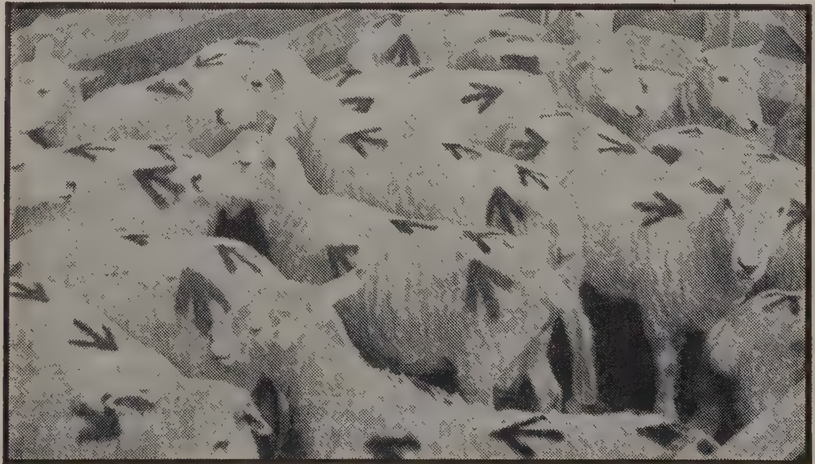
63. **Stragglers or Stray Sheep Shorn to be Branded:** " . . . Every owner in whose shed or on whose land any stragglers or stray sheep have been shorn shall forthwith distinctly and legibly brand such sheep on the head with his registered brand, or, if he has no registered wool-brand, with a distinguishing mark made with an approved wool-marking preparation." This provision is of assistance to the rightful owner in claiming the fleeces of stragglers shorn on someone else's property.

The emphasis placed on the use of **approved** wool-marking preparations is quite a recent provision, introduced late in 1945.

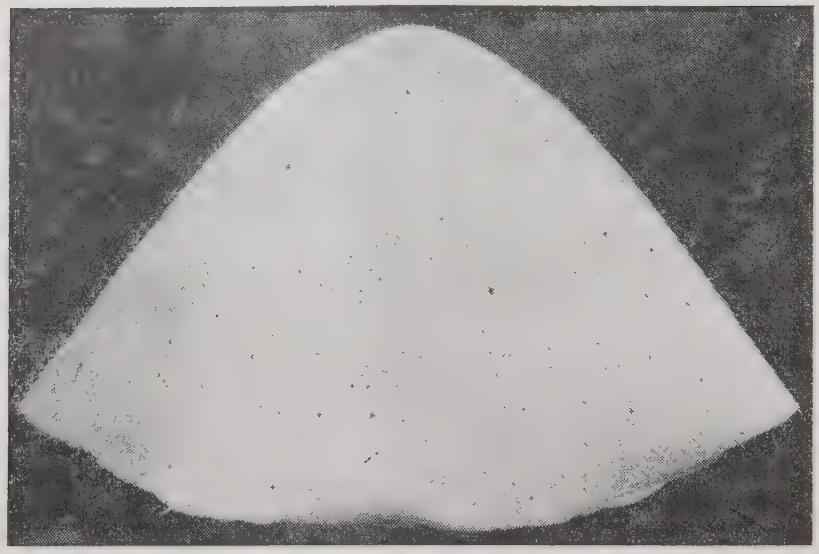
The mill owner and his agent the wool buyer have always regarded branding as an unmitigated evil—a cause for complaint at best, and the source of endless extra trouble and financial loss at its worst. The average farmer when branding his sheep probably never gives a thought to the worry and exasperation he may be laying in store for some mill foreman on the other side of the world. In the past the manufacturing side of the industry has had solid reason for complaint and has at times expressed its disapproval in financial as well as verbal terms. No buyer will pay as much for a line of wool which he expects may give trouble because of brands as he would for a similar unblemished line.

At the mill the wool sorter who handles every fleece does his best to pick out all brands, but he cannot always see small drops and spots of brand which have dripped from the branding iron into the fleece. These can cause subsequent damage out of all proportion to their size.

After being sorted the wool is scoured in long tanks or bowls arranged in series. The first bowl is filled with a weak solution of soap and alkali at a temperature of about 125 to 130 degrees F. The wool is propelled gently through this bowl and at the end passes through a pair of squeeze rollers like a gigantic wringer, which squeezes out most of the liquid before the wool enters the next bowl of the series. In a scouring plant there may be from one to three, or very occasionally four, hot bowls, followed by a rinse bowl where the wool receives a final rinsing with cold or warm water. The usual arrangement is that in each subsequent bowl the temperature and concentration of soap and alkali are lower, and between each bowl and the following one there is a pair of squeeze rollers operating under several tons pressure. Usually the lower roller of each pair is of brass and the upper one is covered with long, strong wool know as roller lapping.



DAMAGE BY BRANDING FLUIDS



The trouble caused by brands in the making of a felt hat. A "hood" (one of the intermediate stages in hat making) with many blemishes caused by small specks of branding material which have melted and spread into the felt.

Damage to Plant

If the branding material is one of the approved wool-marking preparations, it will scour out and cause no further difficulty, but many of the old-type branding oils and most home-made concoctions will not scour out at all. It is bad enough when they pass through the scouring process unaffected and remain as hard, insoluble lumps, but, what is not uncommon and infinitely worse, the brand may soften to some extent and then "bleed." Bleeding releases a stain which not only affects the surrounding wool but sticks to the wool roller lapping and then imprints itself on much additional wool as it passes through the rollers. One small lump of brand can thus damage a considerable quantity of wool.

Where hard lumps of brand pass through the scour unaffected they are likely to cause damage to the fine wire teeth on the carding machines. The rotating cylinders of these machines are covered with "card clothing" on which the myriads of delicate wire teeth are set to close tolerances to effect a thorough yet gentle opening of the wool. Any bending or breaking of these teeth detracts from the efficiency of the process and leads to irregularities in the yarn produced. Lumps of brand are broken up to some degree in the carding process but are not entirely removed.

In the worsted process they will find their way through to the combing machines. The combs are considerably more delicate in their construction than the carding machines and the vertical steel pins on the revolving circles are slender, tapering, and set with a high degree of precision. Lumps of brand can bend or break them, or block them up so that a group of them is put out of action. Whatever the nature or the extent of the damage, there will be a corresponding drop in efficiency and an increase in irregularity of the product.

Effect on Products

The comb turns out two products: A combed sliver of wool (which subsequently becomes blended with other slivers to form a ball of combed "tops"), and the short fibres known as "noils," which are removed from the longer and stronger fibres. Particles of brand will find their way into both products, much to their detriment. Noils are by no means a waste product and are extensively used in the woollen trade for blending, for making felts, and in the case of fine noils for making felt hats. In the making of hats even apparently infinitesimal specks of branding material can cause an astonishing amount of damage, for in the conversion of noil to felt, and felt to finished hat, much heat and pressure are employed, which melt and spread the brand. As a result spots and smudges of colour appear apparently from nowhere on the semi-finished hat and have to be dealt with individually by hand—a slow and costly process.

With woollens and worsteds the tale of damage is similar, and particularly pronounced with light-coloured goods or pastel shades. At times the blemishes are so numerous and so severe that the only remedy is to dye the cloth a dark shade to hide them. Dark shades are not always in great demand, so whatever remedy is applied is likely to be costly to the mill.

It is certain that these extra costs will eventually be passed back to the grower of the wool—not individually but to all wool-producers. With the certainty of increasing competition from synthetic fibres the wool-growing industry cannot afford to be saddled with costly or unnecessary handicaps.

The time may not be very far distant when an increasing proportion of mill owners may prefer to process standardised synthetic fibres on their machinery rather than wool with all its hereditary and acquired faults. To hold its own wool must be well grown and better prepared for market, which implies full attention to skirting and classing and the removal of all faulty material.

Action Being Taken

In recent times the principal wool-producing countries of the world have taken action to deal with the problem of deleterious branding materials. South Africa, one of the first, passed legislation to the effect that the brand must be clipped from the fleece before shearing and that "wool contaminated by paint or other branding material shall be removed from other wool and packed separately, and the container thereof shall be clearly marked 'Brands.'"

Australia has passed no legislation of this type but the Australian Wool Board has been carrying out an active campaign, including the use of films in colour, to bring home to growers the damage being caused by brands. Growers are being advised that if they must brand, they should do it as little and as lightly as possible. Legislation in several States making branding compulsory is being revoked.

In Eire legislation has been passed prohibiting the use of any colouring matter, either liquid or powder, on wool. The Act provides that if tar or similar material is used as a wool-brand on sheep, the brand must be clipped off before the wool is sold.

Some of the show associations in Britain have laid down rules that sheep exhibited with artificial colouring matter (for example bloom dip) in their wool will be disqualified. During the

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Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in November as under:—

Auckland—1YA, on November 19, at 7.15 p.m., "Litter Production," by H. E. Clark, Supervisor, Auckland District Pig Council.

Wellington—2YA, on November 18, at 7.15 p.m., "The Bacon-curing Industry," by J. H. Owtram, Supervisor, Taranaki District Pig Council.

appraisal period in Britain a suggestion was made that all wool offered for sale discoloured with bloom dips should be penalised 25 per cent. in price.

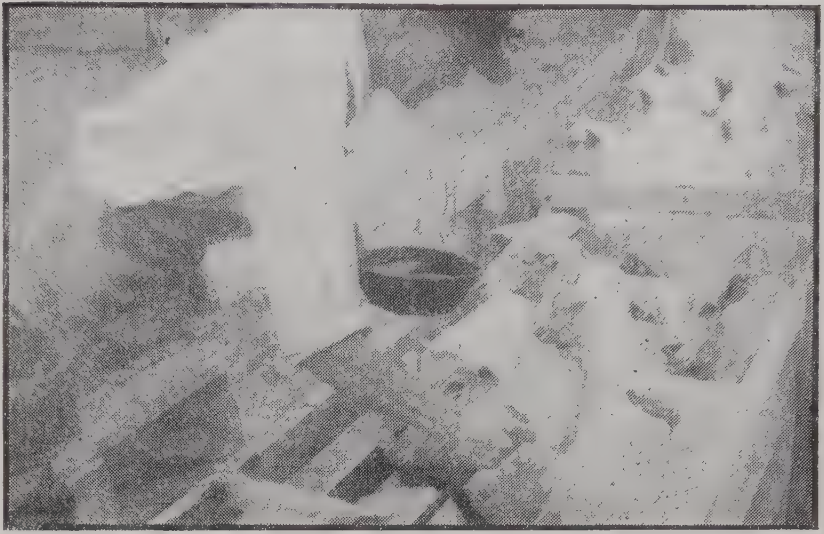
Tests in New Zealand

In New Zealand the problem has been attacked from a different angle. Experiments carried out by the Department of Agriculture in 1940 showed that of the wool-marking substances on the market at that time more than half of the branding oils were unsatisfactory and would not scour out. Branding oils, raddles, wool-marking crayons, and various concoctions made by farmers were tested out for ease of application, legibility, lasting power, and scourability. It was found that all the branding oils lasted well in the wool, the legibility and ease of application varied considerably, but only four of the nine makes of oil could be scoured out after as little as a month's exposure to the weather. The raddles were all similar in that of the four makes tested none lasted more than about a month in the fleece, and no difficulty was found at any time in scouring them out. The wool-marking crayons lasted a little better in the wool than the raddles and were not difficult to scour out.

The important result of these tests was the finding that so many of the commercial branding oils were non-scourable and deleterious to the wool, and that many of the home-made formulas used by some farmers were even worse in this respect. It was decided that something should be done to remedy this state of affairs. It was felt that if some manufacturers could turn out a product which would last well and yet scour out, others should be able to follow suit.

At a conservative estimate at least one per cent. of New Zealand's annual wool clip has been spoilt by brands during the past decade. During the appraisal period the figure was frequently more than double that amount. This wool was worth on an average greasy basis from 5d. to 6d. a pound less than the rest. One per cent. of affected wool in a clip worth £18,000,000 represents an annual loss of at least £75,000—a loss borne by the industry as a whole.

Mr. H. W. McGregor, Controlling Wool Appraiser in South Australia, said in 1945: "As surely as night is different from day, so would an Australian clip marketed without paint marks return a higher price than a clip marketed with this fault over any given period of years. Any decrease in manufacturing costs must be to the grower's advantage, as, conversely, increases in costs must be to his disadvantage. Growers cannot afford to take a narrow view of this problem."



[*Department of Internal Affairs photo.*

Use only approved branding substances and apply them sparingly. If thinning a branding oil is necessary, use one of the following solvents, which are harmless to wool: Power kerosene, mineral turpentine, white spirit, or clear petrol.

To emphasise one aspect, here is a summary of a report from the sorting and milling departments of a well-known woollen mill in New Zealand:—

Of the wool bought 4.15 per cent. had to be sorted out because of brands. These purchases included 33 per cent. of bellies and pieces on which brands get only by accident. Much of the wool affected was among the soundest, longest, and brightest in each fleece. Even then small pieces of brand were missed and went right through to the woven cloth. These had to be removed during the milling and scouring of the cloth, and were estimated to account for 10 per cent. of the wages bill in that section and a loss in output as high as 40 per cent. on light-coloured goods.

There were three likely ways in which the problem could be attacked: By abolishing branding altogether, by making it compulsory to clip off brands before shearing, and by making all branding materials harmless—that is, scourable. The third method was the one chosen as striking at the root of the problem and causing the least trouble and hardship to the user.

Statutes Amendment Act 1945

On December 7, 1945, certain amendments were made to the sections of the Stock Act dealing with branding. These amendments aim to do three things:—

1. Prohibit the use for wool marking of any substance other than those approved by the Minister of Agriculture. Approval is based on practical tests which ensure that the substances approved can be scoured out.
2. Prevent the sale of any substance for wool marking unless it has been officially approved and is in a container or package bearing a label to that effect.
3. Prevent the addition to or mixing with an approved wool-marking preparation of any substance other than a clear volatile solvent that has no injurious effect on wool. This clause is to prevent the dilution of approved branding fluids with such substances as linseed oil and spirit of turpentine, which cause even the best brand to set hard and prevent its removal by scouring.

To avoid unduly penalising manufacturers and distributors who might be carrying large stocks of branding oils which would not pass a scouring test, they were given a period of grace of at least a year in which to quit their old stocks and evolve new formulas which would measure up to requirements. All manufacturers and distributors were advised of the implications of the new amendments on February 5, 1946, and were required to submit samples of their products by March 1. Tests of these had been completed by the middle of April and advice was immediately sent to the proprietors.

The branding materials were applied in the normal manner with a branding iron, but using standardised procedure for mixing and for dipping the iron to get uniform results. After one month's exposure to the weather (to allow the brand to set) the wool was scoured, using a standard method based on commercial practice. When the brand scoured out satisfactorily the makers

RADDLE AND BLOOM DIPS . . .

were given Ministerial approval and required to label their tins or containers: "An approved wool-marking preparation for purposes of the Stock Act 1908." Wool growers should always look for this label when buying branding oils, raddle, or wool-marking crayons.

When brands did not scour out satisfactorily makers were given a period of grace and provisional approval. They were required to label their containers: "Approved as a wool-marking preparation for purposes of the Stock Act 1908 until April 30, 1947."

As from May 1, 1947, no branding material may be sold or used unless it is fully approved, and branding materials carrying the provisional approval no longer meet the requirements of the law. There are probably still many gallons of old stocks on farms throughout the country, and, though it is now an offence to use these, there will probably be a considerable time lag before all old materials go out of circulation.

Farmers should note particularly that they cannot now legally use any home-made branding materials unless they submit them to the Department for testing and approval.

The practice of raddling rams on the brisket for marking ewes at mating is becoming increasingly popular. This practice can spoil a great deal of wool because of the large quantities of marking compound used and its wide distribution through the flock. For this purpose only approved substances can be used legally. At present no proprietary substances specially designed for this purpose are on the market, but it is likely that in the future there will be. If they sell at a reasonable price, the farmer will welcome them, as nobody likes the messy job of preparing these mixtures. At present most breeders use either dry raddle powder or a mixture of raddle powder and oil.

The use of an approved raddle powdered up complies with the Act, but care must be exercised in choosing an oil to mix with it. The use of linseed oil and other drying oils is definitely harmful, as is the use of lubricating or other similar mineral oils.

Only four materials have approval for this purpose at the moment, though others may be submitted and approved in the future. The substances found satisfactory and which can be easily and completely scoured out are tallow, castor oil, neatsfoot oil, and crude lanoline (wool grease). For dilution power kerosene is very suitable. Power kerosene or clear petrol can also be used for thinning a branding oil where necessary. Any farmer wishing to use substances other than those mentioned can submit them for testing by the Department of Agriculture,

Bloom dipping probably deceives no one and does nothing but harm to the wool. Some bloom dips will scour out, but others do irreparable damage. Bloom dipping is an instance of a practice carried on by some only because their competitors do it. Those who do it would probably not be sorry to see it abolished, and the manufacturers regard bloom dips as being more bother than they are worth. The total of sheep "bloomed" with various colouring matters, either by dipping or by hand application, is not very large, but the practice is contrary to the interests of the wool industry and would be better abolished.

A. and P. societies could help in this direction by disqualifying entries which had been "bloomed," as they have done in Britain with beneficial results.

☆

PERSONNEL OF THE DAIRY PRODUCTS MARKETING COMMISSION

[Photo News Ltd. photo.

The first meeting of the Dairy Products Marketing Commission. From left: Messrs. C. M. Williams, H. E. Blyde, and B. C. Ashwin, Hon. E. L. Cullen, Messrs. W. Marshall (chairman), G. M. Pottinger, W. G. Macartney, F. P. Walsh, and R. A. Candy.

ADVANTAGES OF THE LUCERNE CROP

By **P. R. BARRER,** *Instructor in Agriculture, Christchurch.*

ALTHOUGH increasing use of lucerne is being made in most districts, the rate of increase in its area throughout the Dominion is disappointingly slow. There are not many holdings under conditions of low to medium rainfall which would not benefit from at least a small area of lucerne, but the advantages of the crop do not yet seem to have become generally apparent to New Zealand farmers.

TABLE I below shows the use of lucerne by land districts over the last 13 years.

Land District	1930-31	1935-36	1940-41	1943-44
North Auckland	471	436	265	164
Auckland ..	3,681	5.317	5,609	4,140
Gisborne ..	1,256	1,700	1,130	846
Hawke's Bay	3,849	5,901	5,227	5,066
Taranaki ..	5.270	2,473	975	464
Wellington ..	2,121	4,700	3,802	2,464
Total North Island	16,648	20.527	17.008	13.144
Marlborough	2,245	3,328	3,587	3,191
Nelson ..	460	879	1,064	977
Westland ..	9	22	59	nil
Canterbury	4.684	7,182	10,801	16,169
Otago ..	9,415	8,897	9,069	12,123
Southland ..	41	22	77	79
Total South Island	16.854	20.330	24.657	32.539
Total New Zealand	33,502	40,857	41,665	45,683

[Green and Hahn Ltd. photo.

Lucerne withstands drought better than other farm crops and during normal seasons it will produce annually three or four cuts for hay or silage.

First of several interesting features in the table are the outstanding increase in the area of lucerne in Canterbury, which has quadrupled its area in 13 years, and the rapid decrease in the Taranaki district, where it was once a major fodder crop, from over 5000 acres to less than 500. In other districts gains or losses have been relatively small, but, in addition to Taranaki, the North Auckland, Westland, and Southland Land Districts make little use of lucerne, partly because soil and climatic conditions for lucerne establishment and harvesting are less favourable there, and partly, in North Auckland and Taranaki at least, because weed competition may be severe. In Southland the shorter growing season is also a factor.

Another notable feature is that in 1935-36 the North Island grew 51 per cent. of the New Zealand total area, but 8 years later the North Island acreage amounted to only 29 per cent. of the New Zealand total. There is considerable scope for an increased area of lucerne not only in Canterbury, which is now the main growing area, but also in the rest of New Zealand, where its value has certainly not been realised to the full.

Inoculation of lucerne seed is always advisable. The illustration shows effect of non-inoculation of seed on the left and inoculation on the right.

As Hay, Silage, or Greenfeed

As a hay crop, silage crop, or as a greenfeed crop in drought conditions lucerne has certain advantages over permanent pasture or special red clover or other hay areas. It is in some districts a more permanent crop than pasture, and in other districts it will remain established for at least some years. An established stand produces from three to five cuts during the growing season, yielding a total quantity of from 15 to 25 tons of green forage or 4 to 7 tons of hay to the acre. Thus, except in some areas, it establishes its superiority over pasture or red clover hay in the quantity of feed it will produce. Lucerne is also richer in protein than very good meadow or red clover hay, and considerably richer in lime and phosphate content. Well-made lucerne hay accordingly deserves to be at a premium over grass hay.

Establishment

In the establishment of a lucerne stand certain requirements must be met. Lucerne is unsuited to soils with a high water-table or poor drainage or to soils with an ironstone or clay pan. On most other soils conditions can be made good enough for lucerne to do well. Lack of initial fertility can always be countered by the use of lime and phosphate. An adequate supply of lime in the soil is necessary for success, so that unless a soil is known to be high in the lime content a dressing of at least a ton of lime to the acre is advisable.

Weed competition may be severe in the lucerne crop, but success in combating weeds depends largely on the proper preparation of a clean seed-bed. It is no use sowing lucerne on a paddock that remains infested with weeds, especially twitch. Preparatory cultivation should aim at the attaining of a clean, fine, and firm seed-bed. About a fortnight before sowing, the ground may be harrowed and rolled as for sowing, and at the end of the fortnight the harrowing and rolling can be repeated before actual sowing.

Seed and Sowing

Inoculation of the seed at sowing time is most advisable, and as straight superphosphate sown in contact with inoculated seed will destroy the inoculating organisms, serpentine superphosphate or a reverted superphosphate such as is made by mixing superphosphate and carbonate of lime in equal quantities some days before sowing should be used.

From 12 to 16lb. of seed per acre is the usual quantity sown, and the best time for sowing varies according to district and weed infestation. The main sowings are best made from November to January. The sowing date should allow a good establishment before the dormant season of the plant commences in the late autumn. In dry districts broadcasting is a more risky method of sowing than drilling. With cross-drilling there is always the likelihood of burying the second drilling too deeply. Where weed competition is likely to be severe a January sowing is generally preferable to spring sowing, as it gives more opportunity to destroy weeds by cultivation, and annual weeds which germinate in the spring will cause less trouble.

Though the ordinary lucerne plant is not adapted for grazing, careful and limited grazing may not harm stands. Work is being done by the Agronomy Division of the Department of Scientific and Industrial Research on the production of a promising type for grazing purposes.

Several farmers on light land in Canterbury have had reasonably successful results with a mixture of lucerne and cocksfoot used for controlled summer grazing. The lucerne is sown at 10 to 12lb. per acre and the cocksfoot at 8lb. per acre, and the mixture produces feed at a time when subterranean clover has died off.

Some farmers have the impression that lucerne is a difficult crop to grow, but provided sound farming methods are adhered to, the risk of failure in establishing the crop is not great, and there are few farms in districts where rainfall is low or medium on which at least a small area of lucerne would not be an advantage.

NEW MEAT SCHEDULE PRICES

FULL account of the effect on farmers' costs consequent on the withdrawal of primary production subsidies has been taken in the new opening schedule prices for meat announced recently by the Minister of Agriculture, Mr. E. L. Cullen. Allowance has also been made for increases in the wages of agricultural workers as a result of the recent pronouncement of the Arbitration Court.

In announcing the new schedule, Mr. Cullen said that the new prices had been approved after a full and complete agreement with representatives of the New Zealand Meat Producers' Board. He hoped the announcement would allay any fears that might be held by farmers as to the complete reimbursement of their increased costs and that the announcement of the new season's schedule would lead to more intensive efforts by meat producers as their contribution toward helping Britain. In particular, he wished to stress the need for farmers to take full advantage of the supply of fertilisers which was available and for which full allowance had been made in the prices announced.

The new prices for lamb, mutton, and quarter beef for the 1947-48 season are:—

LAMBS (woolly)—	
Prime Down Cross and Prime Canterbury	
20/36	10¾d.
37/42	10⅝d.
43/50	10⅛d.
51/56	9⅝d.
Prime Crossbred	
20/36	10½d.
37/42	10⅜d.
43/50	9⅞d.
51/56	9⅜d.
Seconds	
20/36	9⅞d.
37/42	9⅞d.
43/50	9⅛d.
WETHERS—North Island—	
Prime	
48/U	7⅛d.
49/64	6⅞d.
65/90 as 64lb. at	6⅞d.—36s. 8d.
Seconds	
64/U	6⅜d.
65/72 as 64lb. at	6⅜d.—34s.
WETHERS—South Island—	
Prime	
48/U	6⅞d.
49/64	6⅝d.
65/90 as 64lb. at	6⅝d.—35s. 4d.
Seconds	
64/U	6⅛d.
65/72 as 64lb. at	6⅛d.—32s. 8d.
EWES—	
64/U	4¾d.
65/90 as 64lb. at	4¾d.—25s. 4d.
QUARTER BEEF—	
Ox	
G.A.Q.—720/U	51s. per 100lb.
0/720	48s. ,, ,,
F.A.Q.—All weights	43s. ,, ,,
Heifer	
G.A.Q.—720/U	50s. ,, ,,
0/720	47s. ,, ,,
F.A.Q.—All weights	42s. ,, ,,
Cow	
G.A.Q.—All weights	41s. 6d. per 100lb.
F.A.Q.—All weights	36s. 6d. per 100lb.
BONER BEEF—	
Ox, Bull, Cow, and Heifer	28s. 6d. per 100lb.

Prices to Potato Growers

A NEW schedule of prices which will be paid to growers for f.a.q. grade main crop potatoes delivered next year has been announced as follows:—

(a) South Island Grown.—

(i) Suttons, Dakota, and King Edward varieties: £9 5s. per ton f.o.b., s.i., in the South Island for March to June deliveries, rising thereafter by increments at approximate monthly intervals to £12 10s. per ton f.o.b., s.i., in the South Island for November deliveries.

(ii) All other varieties: 10s. per ton less than the prices for Suttons, Dakota, and King Edward varieties.

(b) North Island Grown.—

All varieties: £11 per ton f.o.r., s.i., for March to June deliveries, rising thereafter by increments at approximate monthly intervals to £14 5s. per ton f.o.r., s.i., for November deliveries.

Growers in the North Island delivering potatoes "tagged" under the auspices of an approved growers' association will be entitled to receive a premium of up to 10s. per ton on the above general North Island prices.

Maximum prices for under-grade potatoes will be in all cases 20s. per ton below the corresponding prices for potatoes of f.a.q. grade.

Increase in Pig-meat Prices

AN increase in pig schedule prices of ½d. per lb. dressed carcass weight for prime grades of porkers and baconers was announced recently. The increase has been approved by the Government to offset the recent withdrawal of the pig crop subsidy of £5 per acre.

The new prices, which came into operation on October 1, 1947, are as follows:—

	North Island	South Island
Porkers, 60/120	9d.	9¼d.
Baconers, 121/175	9d.	9¼d.
Baconers, 176/185	8¼d.	8¼d.

Rail Charges for Artificial Manures

ALTERATIONS in railage charges for artificial manures and raw material, except lime, for the manufacture of artificial manure were made last month. The new charges are based on a minimum consignment of 6 tons, and cover haulage over distances from one mile to 700 miles, the charges ranging from 4s. 2d. to 64s. per ton over those distances.

For haulages beyond 700 miles the charge is increased by 4 2/5d. for every five miles or fraction thereof.

THE PROPAGATION OF CITRUS TREES

By I. L. NOTTAGE, *Orchard Instructor, Auckland.*

AN aura of mystery has always surrounded the art of plant propagation. The craft of the nurseryman, studied, extended and improved over the centuries, has attained a very high technical standard, demanding extensive detailed knowledge from nurserymen producing wide varieties of plants and trees. But there are no mysteries in the strict sense—only an almost boundless variety of fascinating interests, with much still to be learned. Some plants are most exacting in their requirements, calling for tedious manipulation, precise timing, and often laborious care not practicable with the limited knowledge and facilities at the disposal of the layman. Others—some of them fruit trees, including the commonly-grown kinds of citrus—present no real difficulties. Of course, there are rules to be observed, though a few may be and frequently are modified to suit local conditions or even personal preferences. This article describes the propagation of citrus trees, beginning at the seed-bed, setting out the work to be done as they progress, giving correct times for successive operations, and ending with lifting and packing ready for planting in the orchard.

FIRST, a general plan must be made, lest at a later stage the propagator should find himself unprepared for the next operation. The numbers of trees of each kind proposed to be grown must be estimated before anything else is started, for those figures will influence all other calculations.

Next, these points must be decided and arranged:—

The numbers and kinds of seeds for stocks;

Situation and sizes of seed-beds, with shelter if necessary;

Site and area of the nursery block;

Quantities, kinds, varieties, and sources of supply of buds;

Provisions for water supply, cultivation, disease control, budding, and general care of the trees.

Seeds for Stocks

In New Zealand the most popular stocks used are Island sweet orange seedlings; citronelle (rough lemon) and *Poncirus trifoliata* (deciduous dwarfing) are used to a lesser extent, and sour orange (Seville orange) is uncommon. Seed should be taken from old trees retaining vigour and resistance to disease. Most fruits contain about 20 seeds, and about 2000 sweet orange, 2500 Meyer lemon, or 3000 citronelle seeds go to 1lb.

Meyer lemons, and occasionally small numbers of other lemons, are sometimes grown from cuttings, but that is not recommended. Trees grown from cuttings usually branch very low and are difficult to train into better forms with distinct main stems or trunks.

Island sweet orange seed of good quality is obtained from seedling orange trees growing in the Cook Islands. Reject fruits from repacked shipments are the usual source of supply. Extracted seed packed with moist soil is sometimes imported from the Pacific Islands, but has been less satisfactory because advanced germination has been common in consignments received. Fruit retailers can supply limited quantities of reject oranges at times. Island orange stocks have proved very satisfactory for all kinds of citrus trees in New Zealand, their one disadvantage being a somewhat bushy habit of growth, making them a little more difficult to handle in the nursery.

Citronelle (rough lemon) seed is taken from locally-grown trees, frequently arising from stocks on which the scion variety has failed. They grow into vigorous, straight-stemmed seedlings, excellent for nursery work, but less popular as stocks because they make rather vigorous trees, tending to produce coarse fruit in their earlier years and to begin bearing about a year later than trees on sweet orange stocks.

Poncirus trifoliata seed also comes from locally-grown trees, usually kept by nurserymen for that purpose, but supplies are limited. The seedlings are straight-stemmed and vigorous. This stock has a dwarfing effect on scion varieties, but enhances fruit quality and promotes early cropping. It thrives on fairly-heavy, moist soils and transmits some of its cold-resisting properties to the scion. Meyer lemons and Wheeny grapefruit are the varieties most frequently grown on *trifoliata* stock. Its hardiness and dwarfing habit make it most useful for all citrus for small domestic gardens.

Sour (Seville) orange stocks have been used very little in New Zealand. Because they are resistant to bark diseases they have been used extensively in California, but even there they have lost favour recently through being suspected of association with a new trouble known as "quick decline." In New Zealand sour orange stocks have been found incompatible with certain scion varieties, notably Washington navel orange. Insufficient information is available to recommend this stock for general use in New Zealand.

Island sweet orange stocks in a seedling bed.

No other citrus stocks are used on a commercial scale in this country.

Preparation of Seed

Citrus seeds should be sown as soon as possible after removal from the fruit, as they lose vitality if they are dried out. Modern reamers and other juice-extracting machines damage a very large proportion of the seeds. To remove them without injury, cut lightly round the fruits, twist them open, and squeeze the seeds from the halves.

When storage is unavoidable, seeds may be mixed with moist sand in boxes kept in a very cool place, where they may be expected to hold for as long as five or six weeks. They must be examined from time to time for signs of mould infection or germination, and should be sown immediately if these appear.

Polyembryony is a characteristic of citrus. Single seeds often provide several seedlings, of which one may be from a sexually-produced embryo in the manner of most seedlings. Quite typically these are not of uniform characteristics, and also are often rather weak in growth—factors which make them undesirable as fruit tree stocks.

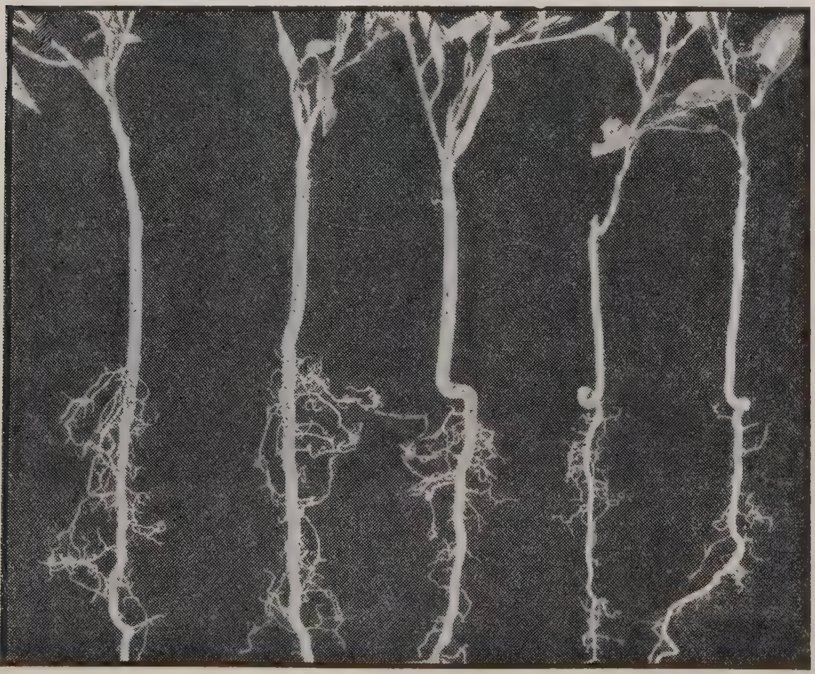
The extra seedlings, known as nucellar seedlings, are vegetative growths arising from what amount to buds on the embryo sac. As with shoots growing from normal buds, these reproduce the qualities of the tree from which the seed was taken. Nucellar seedlings are of very uniform type and in most cases grow more vigorously than do plants from the sexually-produced embryo. This vigour is valuable, for when seedlings are culled before being transplanted most of those selected for the nursery will be sturdier nucellar seedlings.

Rough lemon produces mostly nucellar seedlings, but Island orange seedlings are rather more variable and culling must be correspondingly severe.

Seed-beds

Citrus seeds may be grown in boxes under glass, in beds under a half-shade lath house, or in well-sheltered open-air beds. Granted freedom from damaging frosts, adequate protection from cold winds, good drainage, and an ample water supply, open-air beds have several advantages which have made them popular in New Zealand. Under those conditions the seedlings are less subject to attacks by diseases, grow into hardy plants, and cost less to produce. Failure to provide a convenient supply of water for open-air beds is an all too common fault, often leading to disappointment.

Seedlings may be grown under glass, but to avoid spindly, weak plants they must be given plenty of space in a well-ventilated house. In an exposed, cold, or very dry situation beds covered by a half-shade house will grow good seedlings. The protection given by either glass or lath houses, where conditions make them necessary, has obvious advantages, but in both instances control of seedling diseases, such as "damping off" and brown rot, is much more difficult.



[*Sparrow Industrial Pictures Ltd. photo.*

The two young sweet orange seedlings on the left are suitable for transplanting to nursery rows. The three on the right with bent and twisted stems should be rejected.

Open-air beds are recommended wherever they can be used.

Good-quality soil, preferably of a somewhat sandy texture, makes the best seedling beds, facilitating drainage while retaining sufficient moisture, encouraging free rooting of seedlings, and being easily worked. To minimise risks of soil-borne diseases the beds should be of soil not previously used for growing citrus trees and organic fertilisers should not be used. Deep and thorough preparation is necessary, but the surface should be left level and firm. On heavier soils beds may be raised a few inches above ground level to assist drainage, but the edges should be held by boards to prevent them breaking away.

Sulphate of ammonia in liquid form, at a strength of 1oz. to 4 gallons of water, is effective in promoting and sustaining vigour in the seedlings. Applications by watering can of ½ to 1 gallon a square yard, followed by a sprinkling with water to reduce danger of leaf scorch, are required at varying intervals, according to the progress of growth.

Sowing the Seed

Fresh, well-developed, mature seed is the most reliable. The quantity sown must be sufficient to allow for failure of a small percentage to germinate and for a severe culling before the seedlings are transplanted to the nursery.

The best results are obtained when seed is sown as soon as possible after it is taken from the fruit. Sowings between August and October are the most satisfactory, but earlier seedings may be made if beds can be protected from damaging frosts and are not allowed to become waterlogged. *Trifoliata* seed will be ready and should be planted about April. The seedlings are resistant to mild frost, but even if damaged will shoot away again in spring without suffering materially.

Seeds are often broadcast, scattered evenly about ½ to 1in. apart over the levelled surfaces of the beds, then pressed lightly into the soil. A much superior method, spacing the seedlings to greater advantage for subsequent weeding, spraying, and handling, is to grow them in rows. Seeds are sown 10 to 12 to a foot in ½in. parallel drills 3 to 4in. apart, then pressed lightly into the soil. Whether broadcast or in rows, the seeds are next covered with a 1in. layer of clean sand free from salt. As a surface layer on seedling beds sand has several important advantages. Because it does not bake and crack, sand assists in the retention of moisture during dry weather, but it is also an aid to drainage. Clean sand should be free from weed seeds and soil fungi, and will facilitate hand cultivation if that should be necessary.

Citrus seeds germinate in from three to five weeks, though they may take longer if they are sown dry. Sown in rows, a square yard of bed will contain 300 to 400 seedlings.

Diseases and pests of the beds are dealt with under the heading "Control of Diseases and Pests" on page 409.

Care of Seedlings

Sturdy, upright stocks are the objective. Seedlings ready for transplanting in May, about nine months after seed-sowing, should be 8in. high or more and sturdy in constitution. Beds which are not ready by May can be held over until September, a year from sowing, before the seedlings are transplanted. Many growers prefer September transplanting because beds are easier to maintain through the winter than are nursery rows. On the other hand, autumn transplanting has the advantage that stocks will be firmly established and ready to begin growth with the first warm weather of spring.

To secure the desired growth of seedlings beds must be kept free from weeds, diseases, and pests, constantly moist but not over-watered, provided with sufficient plant food, and well protected from cold or persistent winds. Small or weak plants are unsuitable for transferring to a nursery. Seedlings grown in the beds for one season are to be preferred, but if they make insufficient growth in that time, they should remain in the beds another year rather than be transplanted too small.

Stocks to be shipped away from the nursery should be lifted, carefully culled, and tied into bundles, which should be packed in boxes with the roots wrapped in moist sphagnum moss. The tops must not be wrapped lest they sweat in transit, but they may be protected by a light scrim canopy over a frame attached to the box or crate. The seedlings must be handled quickly to avoid drying out and be forwarded by the quickest available transport. On arrival at their destination they should be unpacked immediately and planted out or heeled in in a moist, shady place.

The Nursery

An ideal citrus nursery site is one almost free from frost, well sheltered from cold winds, and reasonably level for easy working and erosion control. The soil must be well drained yet retentive of moisture under dry conditions, preferably a medium sandy loam of fair quality, 6in. deep or more, and of a type not subject to serious cracking in summer. The subsoil must also be well drained. The area required may be calculated by allowing about 7000 trees to an acre, or more if headlands are narrow.

[Sparrow Industrial Pictures Ltd. photo.

Sweet orange stocks not large enough to be budded but showing the tendency to a bushy habit of growth.

The land will be improved by the turning in of a cover crop at least three or four months before the seedlings are ready for transplanting, for in the nursery organic material may be used to build up the soil without fear of losses such as may occur in the seed-beds.

Most soils will benefit from an application of 10cwt. an acre of hydrated lime or 1 ton of the slower-acting carbonate of lime. After the green crop has been turned in the block should be thoroughly cultivated. Half to one ton an acre of bonedust or blood and bone fertiliser should be broadcast and worked into the soil a few weeks before planting time, leaving the area level and finely cultivated.

Transplanting of Seedlings

Citrus seedlings from beds sown in early spring should be ready for transplanting to the nursery in either May or September of the following year. They should reach a height of 6 to 8in. or more before leaving the seed-beds. If a bed produces seedlings of an average height below the recommended minimum, they must be left to grow on for another season, but weaklings from a well-grown bed must be discarded. If all the seedlings in a bed are poorly grown, the failure may be the result of conditions in the bed or an unfavourable season, whereas if the majority have grown well, smaller plants are likely to be constitutionally weak.

Several days before seedlings are to be lifted the beds should be thoroughly watered, but transplanting must not be attempted during a dry period while the nursery soil is lacking in moisture. Loosen the soil with a digging fork and lift the young stocks carefully, avoiding serious injuries to roots. Grade the lifted seedlings into two or three lots according to size, at the same time rigorously culling out weak, undersized, or diseased plants and any with bent or twisted main roots. Tie the stocks into bundles and trim the tap roots to encourage lateral development. The tops should be headed back to balance the loss of roots. Do not allow roots to dry out through exposure to sun and air.

The seedlings should be spaced at 12 to 18in. intervals in straight rows 42 to 48in. apart, according to the kind of cultivating and spraying equipment to be employed. In large areas paths or roadways must be planned at convenient places.

Seedlings are planted by opening the soil with a spade, inserting them to the depth at which they grew in the nursery bed, and firming the soil round the roots with the foot, using a line as a guide to keep rows straight. Grading the stocks into size groups when they are lifted will facilitate planting in blocks of even-sized plants, which makes budding and subsequent work easier and quicker. The groups of stronger stocks reach a size suitable for budding earlier than their fellows.

The period before budding will be of varying duration, depending on vigour of growth and the height at which buds are to be inserted. Budding should be done at the first suitable

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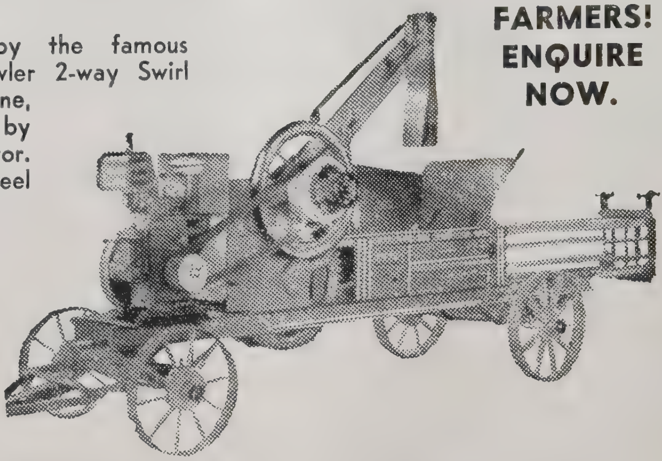

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time after the stocks have attained a diameter of 3/8 to ½in. and at a point on the main stem not less than 6in. above the ground. Exceptionally strongly-growing stocks may reach minimum budding size by March, but the majority will not be ready until the following October or March, and some may take an extra year, especially should higher budding be required.

While the stocks are growing cultivation will be necessary to destroy weeds, which compete with the seedlings for plant food and water, and to conserve soil moisture during the drier summer months. Inter-row cultivation may be by horse-drawn implements or by small motor cultivators. Large, multiple-row tractor implements are unsuitable except when the seedlings are small. Hand hoeing close to and between the trees is unavoidable and must not be neglected.

All cultivation should be thorough and as frequent as is necessary for efficiency, but working must not be very deep. Citrus trees have many feeder roots close to the soil surface, and if these roots are seriously disturbed or damaged in hot or dry weather, the trees may suffer a serious set-back.

Apart from disease control, the seedlings require little attention.

Side growths, except for any which may be strong enough to threaten the vigour of the main stem, should be left until three or four months before budding, when all side growths below the points at which buds are to be inserted should be removed neatly.

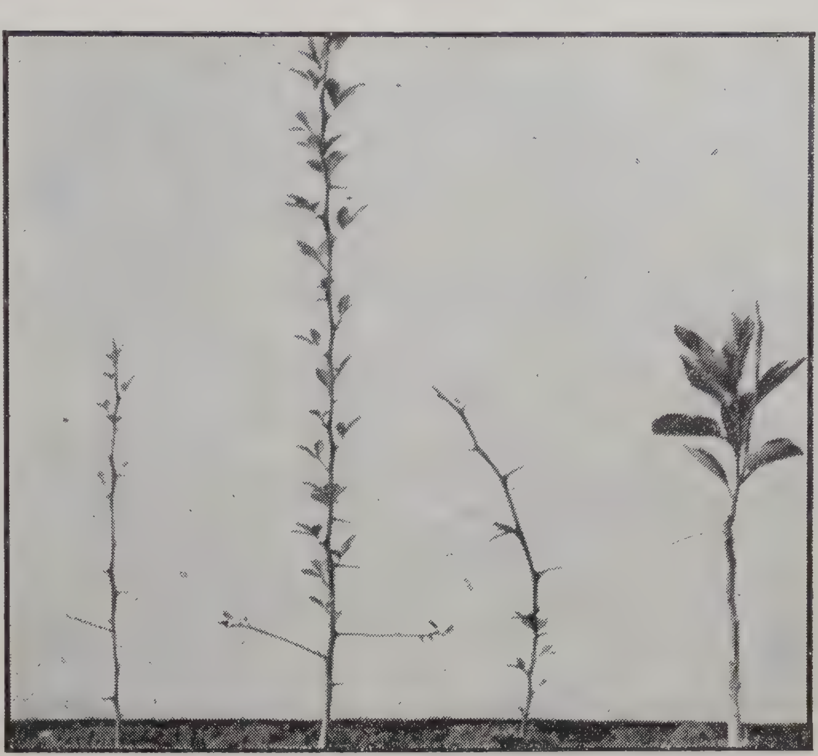
Stocks to be grown on for another season must continue to receive similar treatment, including cultivation, fertilising, and control of diseases.

Buds and Budding

Selection of budwood must be regarded as the most important single item in fruit tree propagation, for the bud, or scion, will grow into a tree having the characteristics, good or bad, of the parent from which it was taken. Therefore, budwood should be cut from healthy, vigorous, bearing trees of the variety required, with a record of heavy production and fruit typical of the variety.

Bud sticks should be selected from mature growths of the past season, with the leaves still attached—the latest matured growths on the trees. When budwood is cut the leaves are removed, leaving about ½in. of leaf stem attached to the bud.

The importance of indicating the positions in the nursery of each variety by durable markers, clearly showing scion and stock varieties, cannot be over-emphasised. A plan of the whole nursery duplicating those marks, and carrying the numbers of each kind budded, is a valuable check, providing against accidental destruction or removal of field markers.



[*Sparrow Industrial Pictures Ltd.* photo.

The four seedlings on the left are *Poncirus trifoliata,* not yet ready for budding but illustrating their almost branchless habit of growth. The tree on the right was budded in the previous season about 7in. above the ground.

Stocks may be budded at any time when the sap is flowing freely and the bark lifts easily if there is no risk of very cold or very wet weather immediately after the operation. In practice, the best times in New Zealand are from late October to early December (spring) or in February-March (autumn). Warmer localities permit extension of these periods, but too many liberties usually result in poor "takes" of buds. Citrus are somewhat more difficult to propagate than are apple or stone fruit trees.

Buds should be inserted in the stocks not less than 6in. above the ground, but they may be placed higher if desired. The object is to place the union—a point specially subject to attack by bark diseases—well clear of the ground.

The style of budding used is the familiar "shield" method, with a T or an inverted T cut through the bark of the stock for insertion of the bud shield. The bud shield is removed by a smooth, shallow knife cut, begun ½in. below the chosen bud and finished ½in. above, taking a thin piece of wood with the bark. Which way the T cut is made in the stock, and whether the wood is removed from beneath the bud, are questions of personal preference rather than practical importance. There is little evidence of material differences in the results if the operator is reasonably quick, neat, and accurate.

The corners of bark made on the stock by the T cut are prized up gently, using the knife blade. The bud is then cut from its stick and pushed, right side up, beneath the bark, using the short piece of stem as a handle. The top of the shield (or the bottom if an inverted T is used) should be level with the cross of the T. The bark flaps are then folded carefully into place over the shield and the wound is firmly bound with raffia or other suitable material, leaving the bud exposed.

Budding ties must be cut loose three weeks after that operation or constriction of growth may injure the buds. At the same time, spring-budded stocks, on which scion growth begins almost immediately, should be headed back to ¼in. above the bud, using a sloping cut to facilitate healing of the wound; care should be taken not to dislodge the freshly-united bud. Another method is to cut the stock 5 to 6in. above the bud, leaving a stub to which scion growth may be tied for support until it is a foot or more long and strongly joined to the stock. Ties on autumn-budded trees must be loosened three weeks after budding, but the stocks must not be headed back until the following spring. Heading back induces tender growth from the bud, which is undesirable until after the dangers of cold winter weather are past.

Stocks on which buds have failed to unite may be budded again when ties are cut, or they can be left until the next suitable budding period.

Stocks should not be kept indefinitely in the hope that some day they will make trees. If a stock refuses to accept a bud after several attempts have been made for two seasons, it should be abandoned.

Attention after Budding

To promote good growth 1 ton an acre of the following fertiliser mixture should be applied in the spring in which scion growth begins; better-quality land may need slightly less:

4 parts each of dried blood and bonedust or 8 parts of blood and bone;

2 parts of superphosphate;

1 part of sulphate or muriate of potash.

Potash is included because it increases resistance to effects of cold weather and aids hardening off of new growth later in the autumn.

This fertiliser mixture should be distributed close to but not in contact with the tree stocks and must be worked into the soil, chiefly by hand hoeing. Trees grown on for a second season should be given a similar fertiliser application in the following spring.

Cultivation, including hand work, is necessary for weed control, as well as to reduce loss of soil moisture in hot weather. Frequent shallow cultivations give the best results. Irrigation of large areas is often impracticable and always expensive, but may be possible for smaller blocks and will be of great assistance to trees growing in soil of poor moisture-holding qualities.

All shoots arising from stocks must be suppressed from the time the stocks are headed back. Side growths rub off very easily while they are young and tender.

Only one stem should be permitted to grow from the bud. As this stem will become the trunk of the tree, straight, unchecked, erect growth should be encouraged. Staking and tying of growing nursery trees are essential to guide the young shoots. Stakes must be sturdy, 40 to 48in. long, and straight. They should be driven firmly into the ground before growths from the buds begin. To keep young trees straight, and to prevent the growing shoots from breaking off in strong winds, several ties will be required. Special care is necessary when making the first tie, for some of the shoots will be very tender and easily broken away from the buds. Very tender growths must not be tied. Stakes must not be removed until the trees are firmly established, but they should be required for no longer than a year.

Vigorously - growing spring - budded trees can develop to a size suitable for planting in the orchard by autumn of the same season, but to do so they must start on strong, well-grown stocks; less vigorous trees require an extra season's growth. Autumn-budded trees may be ready for planting by the following autumn, but they too may need a second season's growth. In general, trees which have reached

PEST OR DISEASE	SYMPTOMS	CONTROL MEASURES	TIMES TO SPRAY
Citrus brown rot (*phytophthora citrophthora*)	Attacks leaves and stems of all citrus, causing dark brown blotches on leaves, wilting, serious defoliation, and even death of young seedlings. Most dangerous from late autumn to spring.	Bordeaux mixture 3:4:50	Spray in May as a precaution and at any other time on first sign of infection.
Verrucosis (*Sporotrichum citri*)	Rough, scabby, light-brown lesions on young stems and leaves of citronelle, Meyer lemon, and sour orange trees. Rarely affects sweet orange, mandarin, or N.Z. grapefruit trees	Bordeaux mixture 3:4:50	One to three sprays in October, November, and December (November as a precaution), plus an autumn application as for brown rot
Citrus blast (*Pseudomonas syringae*)	Blackening of twigs, petioles, and basal portions of leaves	Bordeaux mixture 3:4:50	Usually controlled by sprays as for verrucosis. Extra applications if necessary
Scale insects (several kinds)	Small scales on stems or leaves. The insects suck sap, debilitating trees if the infestation becomes severe. Soft scales exude honey dew on which sooty mould thrives	Summer oil 3:100	One application in February, with one or more additional sprays at monthly intervals until control is secured
Red mite (*Paratetranychus citri*)	Tiny mites which suck sap, causing dry, grey appearance of leaves. Usually found on under sides of leaves	Summer oil 1:100	Special applications seldom necessary. Usually controlled by scale sprays
Thrips (*Heliothrips haemorrhoidalis*)	Very small yellowish insects, which rasp surface tissues, causing silvering or greying and distortion of leaves	Nicotine sulphate 1:800, plus soft soap 3lb. to 100 gallons of water. Soap is unnecessary if nicotine is used in combination with other sprays	Spring and summer. May need several applications, but not usually troublesome
Aphides (*Aphis citricidus*)	Small, usually dark-brown insects which attack tender tip growth, causing serious leaf distortion. Found in colonies on tender new tip growth. They retard tree growth	As for thrips	Usually in dry weather from late spring to early autumn. Spray whenever aphides appear in serious numbers
Leaf roller caterpillars	About ⅜in. long and of various light colours. They damage leaf surfaces and bind leaves together with webs	Arsenate of lead 1½lb. to 100 gallons of water, plus 3lb. of hydrated lime. Do not combine this with oil sprays	October to December or a little later
Citrus canker of Japan (*Pseudomonas citri*)	Small brown spots surrounded by a narrow yellow "halo" on leaves; slightly-raised spots on both surfaces of leaves, up to a little over ⅛in. in diameter; similar slightly-raised, brown spots on stems but lacking yellow "halo." Usually most conspicuous and active in hot, humid seasons. May attack citrus trees at any stage of growth, even in seedling beds	No effective control is known	Advise the Orchard Instructor for the district immediately if signs of this disease, or any suspiciously-similar symptoms, appear on the trees or seedlings. **This action is essential and urgent**

planting size fairly quickly are considered superior, because, having done well in the nursery, they must be vigorous types. Sturdy trees, with well-developed and evenly-formed heads, are the most desirable for planting out in orchards. One-year trees—those which are one year or less from the bud—may be distinguished from two-year or older trees because they have leaves still attached to their trunks, whereas the trunks of older trees are bare.

One-year trees are usually left unheaded whether or not they have branched, but those to be grown on to the two-year stage should be topped at about 24in. high during their second spring if they have not formed a natural head. The height of heading varies with the length of main stem desired, but the cut should be made about 6in. above the point at which the lowest branch is required.

Control of Diseases and Pests

Comparatively few serious diseases or pests attack citrus nursery stock, but effective measures to control them are of utmost importance, for infected trees from a nursery may distribute these troubles over a wide field. Control measures should cover not only the nursery trees but also older citrus trees and any other host plants in the vicinity.

"Damping off" caused by soil-borne fungi may give trouble in seedling beds, especially in shaded positions. Precautions against infection include thorough drainage of beds, the use of clean soil, and the application of chemical in preference to organic fertilisers. Preventive measures recommended are sterilisation of the soil if seedlings are to be grown in boxes, and thorough watering of the soil with permanganate of potash solution at a strength of 1oz. to 4 gallons of water.

Cut worms may attack very young seedlings. They injure the stems just below or a little above ground level, causing the plants to break off at that point. Cut worms can be controlled by using a poisoned bait made up by mixing 1½lb. of bran with 1oz. of Paris green, then dissolving ¼ pint of molasses or treacle in 1½ pints of water and mixing in the bran and Paris green. This quantity, broadcast in the evening, is sufficient for 200 square yards. The bait should be mixed in small quantities and used within a few days, before it goes mouldy.

Neither cut worms nor "damping off" seriously trouble seedlings planted out in nursery rows, where they have more air space and are strong enough to resist attacks.

Diseases and pests which may and frequently do attack citrus nursery stock at any stage, not excluding in seedling beds, are listed on the opposite page. Brown rot, verrucosis, scale insects, and aphides are the most common and serious in New Zealand nurseries. The remainder, except citrus canker, are usually less troublesome, but they must not be neglected if they appear on nursery trees.

Citrus canker of Japan is a bacterial disease for which there is no known effective control. For that reason, the Orchard Instructor for the district must be advised immediately any suspicion of infection appears on citrus trees.

Spraying Equipment

Small nurseries can be sprayed effectively and economically with knapsack or similar manually-operated pumps. Larger nurseries require power-driven pumps with spray tanks of greater capacity. Several makes of small power-operated units suitable for nursery work are made; some are hand drawn and others may be drawn by or attached to popular makes of motor cultivators.

Effective spraying equipment is most important because nursery trees are distributed far and wide. Should they be infected, the diseases or pests travel with the trees to build up trouble for the unfortunate purchaser. Without adequate equipment satisfactory control measures are extremely difficult, if not impossible.

Lifting and Packing Trees

Citrus trees should be lifted from the nursery bed in May and June. To check growth and harden up the trees they require wrenching three or four months before digging time. That is accomplished by cutting, to the full depth of a sharp spade, 6 to 9in. from the tree stems on four sides.

The trees may be lifted with bare roots, or dug with soil attached and then "balled." In neither case should they be allowed to dry out before being packed. Sandy or loose soils are unsuitable for balling because they will not cling unbroken to the roots.

After any damaged roots have been trimmed, trees lifted without soil are labelled and packed promptly, with their roots carefully protected by moist sphagnum moss. Those to be "balled" must be lifted with special care to avoid the breaking away of soil attached to their roots. The ball of soil containing the roots is trimmed neatly and enclosed firmly in a piece of sacking tied about the base of the tree trunk. The ball is then bound with twine, much in the manner of a paper parcel, to support the sacking and hold the soil firmly round the roots.

Labelling the trees with variety names before or immediately after they are dug is very important, for, though most kinds of trees are easily recognised, there may be no clearly-distinctive characteristics by which to separate varieties. Careless labelling may be of serious consequence to a buyer who has ordered varieties for special purposes. These remarks apply with equal force to fruit growers producing trees for their own orchards, for they must accept the responsibility as well as the consequences.

[*Sparrow Industrial Pictures Ltd. photo.*

A two-year Wheeny grapefruit tree, budded 6in. above the ground, showing the method of balling and labelling trees for transport.

Important Points Summarised

Select really suitable sites for seedling beds and nursery.

Cull seedlings rigorously before transplanting.

Take buds only from trees of known true varieties and with first-class performance records.

Carry out all cultural, disease control, and propagation operations thoroughly and at the correct times.

Cull trees when or before lifting them for distribution.

Label, lift, and pack trees carefully and with no avoidable delay.

Without detracting from the importance of high standards for all other work and materials contributing toward the production of first-quality trees, sound bud selection must be recognised as the point most vitally affecting their ultimate value as units in commercial citrus orchards or in domestic gardens.

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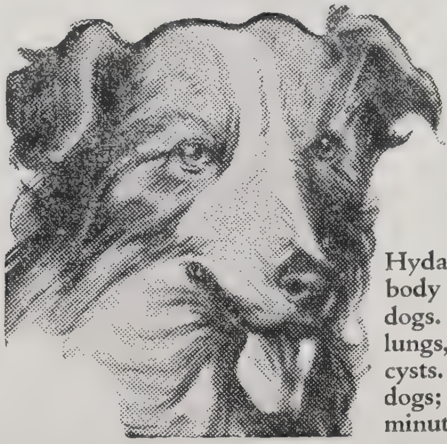
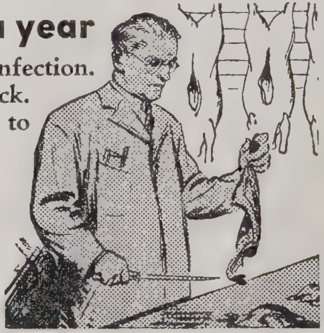


Dogs fed on offal may become carriers of Hydatid worms, whose eggs are distributed in their droppings. These dry and crumble into dust which is easily picked up.

Hydatid eggs get into the human body from hands that have touched dogs. These eggs lodge in liver, lungs, etc., and may grow into large cysts. *Never* throw raw offal to dogs; cut into slices and boil for 10 minutes first, otherwise burn or bury.



N.Z. Farmers lose £150,000 a year through meat livers rejected because of infection. Stock infect dogs, but dogs reinfect stock. Take precautions. Use Arecoline tablets to dose your dogs.

Dose your dogs regularly.
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STANDARD POULTRY MASHES

Overcoming Difficult Food Situation

By F. C. BOBBY, *Superintendent of Poultry Husbandry, Wellington.*

TO many poultry producers the reasons for introducing standard poultry mashes for all classes of poultry keepers a year ago are well known and accepted as being sound, and though they may not have liked being compelled to accept ready-mixed mashes, they agree that the scheme is the best possible under present circumstances and has assisted the poultry industry. It is, however, quite evident that there are other producers who do not yet understand the reasons for introducing a standard poultry mash scheme and who believe that with bran, pollard, and meat meal they could make their own mashes of higher feeding value than standard mashes. For this reason a brief review will be given of the feed situation as it was when standard mashes were introduced and of the position today.

A YEAR ago an already difficult poultry food position deteriorated rapidly. The first reason for this was the raising of the extraction rate of flour to 80 per cent., with a consequent loss of pollard to poultry producers and, equally important, an appreciable loss in the feeding value of pollard. The second reason embraces the availability of grains suitable for poultry feeding. Barley, generally popular with poultry producers, was in short supply, and automatically demands for wheat increased. At the same time wheat in the form of wheat meal was required for mash mixing, as pollard had become of no greater feeding value than bran. The wheat meal was required to put back into the mash what the pollard had lost in feeding value. Australia had at the same time placed an embargo on the export of stock meal, pollard, and bran—a fact not appreciated by many producers.

The position at this stage could still have been faced without any compulsory scheme if wheat had been available in unlimited quantities. Poultry producers in the North Island are almost entirely dependent upon wheat imported from Australia, but the quantity which can be imported from Australia by the Government at present is strictly limited.

To meet the situation outlined standard poultry mashes were introduced because:—

1. The best coverage of the foods available was achieved, and

2. Poultry producers then received mashes in which the ingredients were at least consistent.

The scheme has avoided for most of the time the frequent changes poultry producers had been forced to make in their home-mixed mashes because of the constantly-changing position of supplies of any or all the poultry foods normally used. Poultry producers could not have made better-quality mashes at home than the standard mashes during the past year unless they had had access to far greater quantities of wheat than have been available. Admittedly standard mashes have varied in quality to some extent according to the samples of oats available to mash manufacturers.

The Future Position

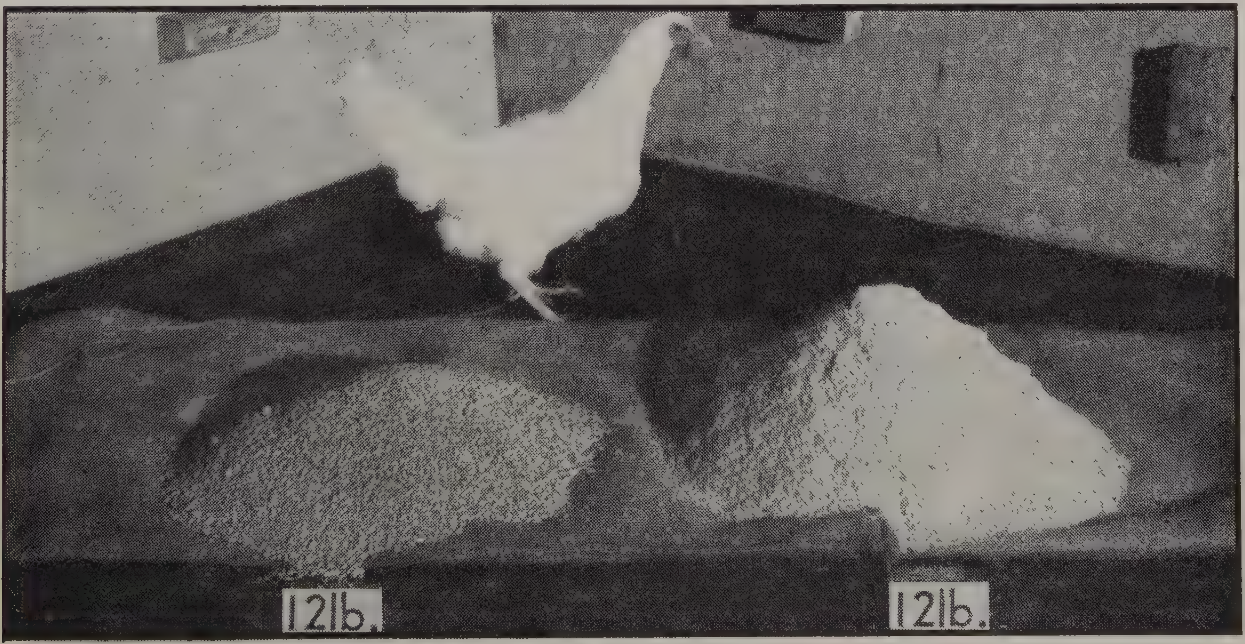
Though it is not possible to predict the position in a year's time, indications which may be given of the probable position for the next 6 months may help producers to plan ahead, which is essential if their farming management is to be efficient.

The position of poultry food supplies may be summarised as follows:—

Wheat: There are no indications that supplies of wheat, which are practically the key to the poultry food situation at present, will increase in the next 6 months; it is more likely that wheat will be in shorter supply.

Barley and oats: Barley and oats are in short supply and will become less available until the new season's crops are harvested.

Maize: The expected 50 per cent. increase in this season's maize crop over the previous one has come at a most



The quantities of food shown above are necessary to raise a pullet to the laying stage. Unthrifty growing pullets should be culled so that valuable food is not wasted.

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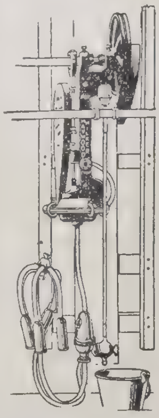

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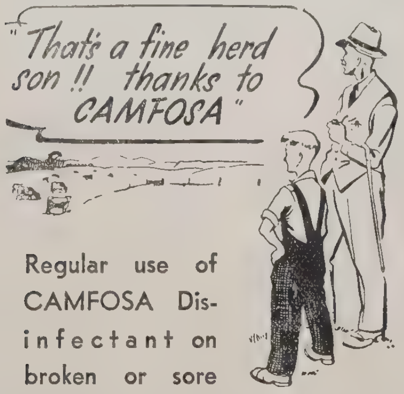
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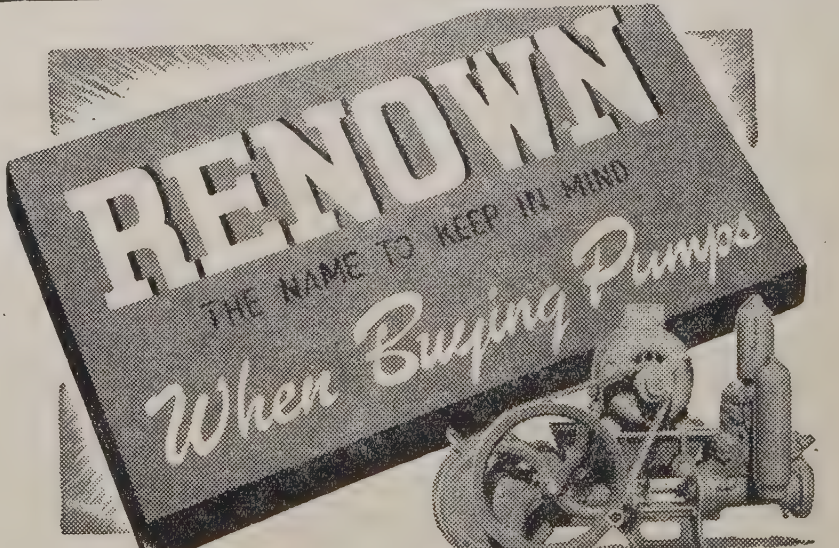

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A pullet in a year eats the quantities of grain and mash shown above. To obtain maximum egg production in the present food shortage it is essential to keep only high-producing birds.

opportune time, and how it will benefit poultry producers is discussed under the heading of alterations to standard poultry mashes. Not only, however, will there be an increase in the amount of maize included in standard poultry mashes, but it is anticipated that a limited quantity will be available as whole or kibbled grain.

About 90 per cent. of marketable maize is released to the poultry industry, the residue being used for seed maize and human consumption. The proportion to be sold as whole or kibbled grain is released strictly on the understanding that it shall be used by poultry producers only.

Standard Mashes

The initial difficulties in manufacturing standard mashes have largely been overcome, and after the severe food shortage in the North Island during December to February last there has generally been sufficient mash to meet the demand. At no time has the South Island been short, and the situation is now satisfactory in the North Island.

The tightening up on the distribution of pollard and bran has resulted in adequate quantities being available for mash mixing, though this satisfactory state of affairs has been spoilt to some extent, particularly in certain districts such as Taranaki and Wanganui, by lack of shipping space to move these meals from the South Island.

The output of standard mashes is more likely to be affected or limited by the amount of wheat available than by any other ingredient.

Instructions have been issued to all licensed standard mash manufacturers to change the formulas of these mashes, mainly as a result of the increased maize crop, but also to adjust some anomalies in supplies of pollard and bran in the North Island. The figures below indicate the changes made, the previous percentages of ingredients being in parentheses:—

NEW FORMULAS FOR STANDARD LAYING MASHES—NORTH ISLAND ONLY

	No. 1 Laying Mash Per cent.		No. 2 Laying Mash Per cent.	
Bran	18	(25)	20	(27)
Pollard ..	27	(20)	30	(22)
Wheat meal ..	20	(20)	23	(23)
Maize meal ..	10	(21)	10	(24)
Ground oats or barley meal	11		13	
Meat meal ..	10	(10)	—	(—)
Common salt	1	(1)	1	(1)
Lime	1	(1)	1	(1)
Grit	2	(2)	2	(2)
	100		100	

NEW FORMULAS FOR STANDARD LAYING MASHES—SOUTH ISLAND ONLY

	No. 1 Laying Mash Per cent.		No. 2 Laying Mash Per cent.	
Bran	25	(25)	28	(27)
Pollard ..	20	(20)	22	(22)
Wheat meal ..	20	(20)	23	(23)
Maize meal ..	10	(21)	10	(24)
Ground oats or barley meal	11		13	
Meat meal ..	10	(10)	—	(—)
Common salt	1	(1)	1	(1)
Lime	1	(1)	1	(1)
Grit	2	(2)	2	(2)
	100		100	

Standard Chicken Mashes

Standard chicken mashes, which remain the same for both islands, apart from an insignificant increase in the quantity of maize meal included, are as follows:—

	No. 1 Chicken Mash Per cent.	No. 2 Chicken Mash Per cent.
Bran	22.5	26
Pollard	18.5	20
Wheat meal ..	25	27.5
Maize meal ..	20	22.5
Meat meal	10	—
Common salt ..	1	1
Lime	1	1
Grit	2	2
	100.0	100.0

Reasons for Changes

The most important change in the laying mash is the compulsory inclusion of 10 per cent. maize meal. The maize crop last season was insufficient to permit the addition of maize meal in a specified quantity on a compulsory basis. The inclusion of 10 per cent. maize meal will improve the feeding value of the mash. It has been contended and with justification that the laying mashes during the last 12 months have lacked starch (carbohydrate) content. Maize is rich in easily-digested starch, and as the new pollard lacks the starch content of the old pollard, the inclusion of maize in the mash partially replaces the loss of starch.

Some poultry producers have a prejudice against the use of maize, and vague stories are heard about maize being "over-heating" (a term which has no real meaning). However, maize is a first-class food for poultry, for both growing and mature stock.

American poultry farmers use up to 50 per cent. maize meal in their laying rations. No fear of fattening laying birds need be felt, providing such birds have the right breeding and have inherited the ability to lay. Of course, if maize is fed in excess, it can fatten, but the amounts of maize in the laying mashes (10 per cent.) and the chicken mashes (20 per cent.) need give no fear of this happening.

The quantities of pollard and bran have been changed in the laying mashes for the North Island. The total of the two combined has been altered only slightly, but the rates of pollard to bran have been increased, as more pollard and less bran is available in the North Island than was anticipated at the introduction of standard mashes. This will have no influence on the feeding value of these mashes because the nutritional value of pollard is probably no higher than that of bran. Every endeavour will be made to avoid having to increase the proportion of the two meals to more than 50 per cent. of the mash.

With the reduction of the amount of ground oats to be used there is likely to be a reduction in the fibre content of the laying mashes, particularly in cases where manufacturers could not use plump white oats. This reduction in fibrous material will be welcomed by producers.

Feeding Value of Standard Mashes

Much criticism of standard mashes has arisen because many poultry producers have been forced to change over from simple home-made mashes which they have used for years. As the ready-mixed mashes look different and handle differently, it is argued that they are inferior. Standard mashes are frequently criticised as being "low in feeding value" or "poor-quality mashes," but those criticising can base such statements only on the appearance of the mashes, as in nearly all cases they have no means of comparing previous mashes with present-day mashes on a true nutritional basis. The food value percentages of the new standard laying mashes are as follows:—

	Per cent.
Protein	16.30
Oil	4.35
Carbohydrates	50.88
Fibre	6.65

These figures represent the total or crude amounts of each constituent, not the digestible amounts. The total amounts have been taken so that a direct comparison can be made with the maximum and minimum figures declared by manufacturers under the Stock Foods Act. In computing these figures those taken for pollard were the same as those for bran, as pollard is of no higher feeding value than bran.

The food value percentages of the typical home-mixed mash used before the introduction of the standard mashes (2 parts of pollard, 1 part of bran, and 8 per cent. meat meal) are as follows:—

	Per cent.
Protein	18.40
Oil	4.13
Carbohydrates	55.40
Fibre	3.60

The home-mixed mash shows a higher feeding value than the present laying mash, which is being mixed under emergency conditions caused by food shortages, but the difference is not sufficient to justify the exaggerated statements made today. Some producers may be surprised at the higher protein of the home-mixed mash, particularly as it contains only 8 per cent. meat meal compared with 10 per cent. in the standard laying mash. The reason is that pollard before the war contained more protein than bran, maize, or ground oats, and the home-mixed mash contained 70 per cent. pollard.

Wrapping of "Journals"

BECAUSE of the acute paper shortage it will be necessary for copies of the "Journal" to be sent to subscribers in future in wrappers instead of in envelopes. This change is regretted, but subscribers are assured that as soon as paper is more freely available copies of the "Journal" will again be delivered in envelopes.

There is little or no difference between the two types of mash in the oil content, but in the home-mixed mash there is about 4½ per cent. more starchy material (carbohydrates). This is important and indicates that standard mash would benefit from additional wheat meal or maize meal if either were available.

There is a marked increase in fibre in the standard mashes, and though this will not necessarily harm the birds, it is of little feeding value. To make the two mashes about the same on analysis 2 to 3 per cent. additional meat meal and 6 per cent. additional wheat meal would be required in the standard laying mash.

Such additions are not possible on a Dominion basis because of the present food supply position, but if any poultry producer is in a position to make these additions, particularly in winter, he will have an improved mash.

Food Consumption of Laying Birds

A common inquiry is: How much does a laying bird eat, or how much food does it take to raise a pullet to the laying stage? The food consumption of light and heavy breeds of birds has been determined under practical conditions many times and in many different parts of the world.

The Laying Hen

The amount of food usually accepted as necessary for one laying bird for a year is 45lb. of mash and 45lb. of grain. Consumption during any particular part of a year will vary with the egg production, the maximum consumption therefore being in the flush of the year, when the egg production percentage is highest, and the minimum consumption during the moulting period while the bird is completely out of production.

Thus on an average during the year 100 laying birds will consume 175lb. of food per week, or 87½lb. each of mash and grain.

The Growing Pullet

The feeding of a pullet from a day old to the laying stage at, say, 5 months has likewise been studied and sound practical figures obtained. In this case, however, the information required is complicated by the fact that the consumption rate is always increasing as the bird grows and increases in body weight. The table given below is based upon actual tests in food consumption of growing White Leghorn pullets, but should be taken only as a guide, as food consumption varies according to the system of management and feeding, and differences will occur between one season and another. The table covers the total consumption of food and does not give figures for grain and mash separately because the method of feeding is a big influencing factor.

TOTAL FOOD CONSUMPTION OF 100 WHITE LEGHORNS PULLETS TO 20 WEEKS OF AGE

Week	lb.
1	14
2	28
3	31
4	39
5	50
6	58
7	70
8	77
9	90
10	96
11	105
12	115
13	120
14	125
15	130
16	140
17	142
18	145
19	150
20	154

A table of this kind is primarily of value in estimating quantities of food required for a given number of birds when purchasing foodstuffs or calculating costs of food requirements. Though the table gives a total consumption per bird to 20 weeks of age of about 19lb., in ordinary circumstances, and allowing for average mortality, it is customary to allow about 23lb. of food to bring an average pullet to the point of lay.

THE GOOD NEIGHBOUR

Kaka Feathers and Kokowai

EVER since Eve first tucked a flower or two in her hair and peered into a crystal pool to appraise the effect, women through the ages have obeyed the primeval instinct to indulge in personal adornment, thereby adding to their natural charms. New Zealand's colonists found the brown-skinned maidens of Ao-tea-roa no whit less feminine than their pakeha sisters in this respect, and we are indebted to one of the arrivals in the Tory at Petone in the early 1840's for the most colourful portraits of the Maori belles in all their finery of kaka feather cloaks and kokowai (the equivalent of our rouge). George French Angas primarily came to New Zealand as an official of the Union Bank of Australia, but the opportunity to study the customs and culture of the Maori afforded his artistic talents such wide scope that he spent most of his time travelling up and down the country, visiting not only the coastal areas, but also the remote inland fastnesses, dwelling among the different tribes for lengthy periods, and on several occasions accompanying the expeditions of Sir George Grey, the Governor who set himself to master the Maori language so that he might better understand the people and translate and record their ancient poems and legends.

Angas's volume "The New Zealanders," published in 1846, is surely the most beautiful work of its kind ever produced. The copy I saw was "respectfully dedicated" to H.R.H. Prince Albert in the copperplate handwriting of the artist. Here were depicted smiling mothers with their children; proud chiefs and mighty warriors; aged crones; and young girls as lovely as the garlands of kowhai ngutu kaka (red kowhai) or piki arero (starry clematis) in their hair. The older women wore their dark tresses flowing loosely over their shoulders, betokening their wifehood, and the maidens approaching marriageable age had their hair cut in a thick fringe across their foreheads. Feathers were a favourite form of head-dress, and sometimes bunches of albatross feathers or the head and breast plumage of a huia or a tiwakawaka (fantailed fly-catcher) would be used as ear ornaments in place of the traditional mako taniwha, the tooth of the tiger shark, or pendant of pounamu, precious greenstone. The small boys, especially, seemed to delight in feather decoration, and Angas shows one youngster with a whole bird (albeit a tiny one) dangling from his ear, and another wearing the wings of a hawk fastened round his head by flax. Furthermore, the latter, who happened to be the son of a celebrated chief, had his hair anointed with shark's oil and his cheeks rouged with red ochre! But he was only imitating the elder members of his sex, who were not averse to enhancing their physical attractions by the liberal use of oils, kokowai (red ochre), and other paints made from coloured clay.

In addition to their aesthetic merits, Angas's paintings are invaluable for the wealth of detail concerning Maori clothing. They portray all types of garb, from kokahu, ordinary flax garments for wet weather, off which the rain ran "as from the thatched roof of a house," to elaborately-woven cloaks bordered in gay, geometric patterns or adorned with twisted strings of flax or bright tufts of wool, and war mats covered with feathers or pieces of dog's skin. Many of these mats took as long as twelve months to make. Much patience and skill were needed to secure each separate feather in place or to fasten different shades of dog's hair on to flax fabric in stripes resembling a tiger's skin. The carving of hei-tiki, or neck pendants, was another tedious task, such articles being highly prized in consequence, likewise the handsome mere of greenstone, which were frequently handed down from father to son. Besides numerous portraits Angas drew native pas, meeting-houses, weapons, canoes, monuments, etc., all of which were decoratively designed.

In his book, "Maori Art," W. J. Phillipps, well-known authority on the subject, states that Maori art is fundamentally curvilinear; from the simplest curves the most complicated designs have been built up, and it is in the use of curves that the Maori has achieved his highest form of artistic expression. The tuhi, the rafter patterns in houses, consist largely of two undulating lines evolved from the koru, a little curving stalk with a bulb at one end. This is found, too, in the art of ancient Greece, India, Burma, and America. Then there is the whakamarama, the crescent moon shape. Such activities as fishing, fowling, and agriculture were governed largely by the phases of the moon, some days being considered more propitious than others for certain undertakings. Many of the ko, the digging implements, had the whakamarama at the top as a reminder of the moon's importance, the crops being in the charge of the moon god. The Maoris also utilised the bulb of the koru, omitting the stalk, and they evolved between 40 and 50 different types of spirals, a wonderful achievement. Many people think that the spiral element was developed from the fronds of the tree fern, but it is also seen in Burmese design, in the crested birds on ancient Peru ware, in Chinese dragon paintings, and in Japanese scenes, where the motif generally represents clouds or sea foam. Intricate spirals were a feature of the carved prow and stern-pieces of canoes. Being symbolic of speed, they often had the feathers of that swiftest of sea birds, the albatross, lashed to the battens, and from the head of the mast put up to hold a sail was suspended a plume of hawk's feathers, sometimes 6 to 10ft. long. These canoes with their long plumes floating in the wind were a very graceful sight, as is shown in Angas's sketches.

[E. Bierre photo.

Distortion in the carving of the human figure was caused by either the carver's enjoying the depicting of his subject that way or the desire to encompass the figure within a limited space such as the lid of a box or the lintel-piece of a dwelling, the head being made smaller and the limbs foreshortened. Every tribe has its own explanation of the three-fingered hand. Hari Hongi, the noted Wellington interpreter, construed it as meaning the correct way of holding the hika, the rubbing stick, which when used for making fire was held between three fingers. Another suggestion was that it was derived from the triple-clawed frigate bird of the Pacific. Yet a third belief, held by many old carvers, was that Tiki, the first man, had only three fingers. That most important cultural centre of a village, the whare whakairo, carved house, often had three-fingered projections at each end of the carved facing boards.

Thus the Maori applied his remarkable artistic gifts not only to the adornment of his person, but to his every possession, both great and small, so that all phases of his life were enriched by his love of the beautiful.

Mary

Farmers

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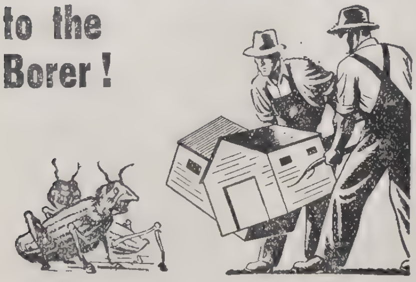

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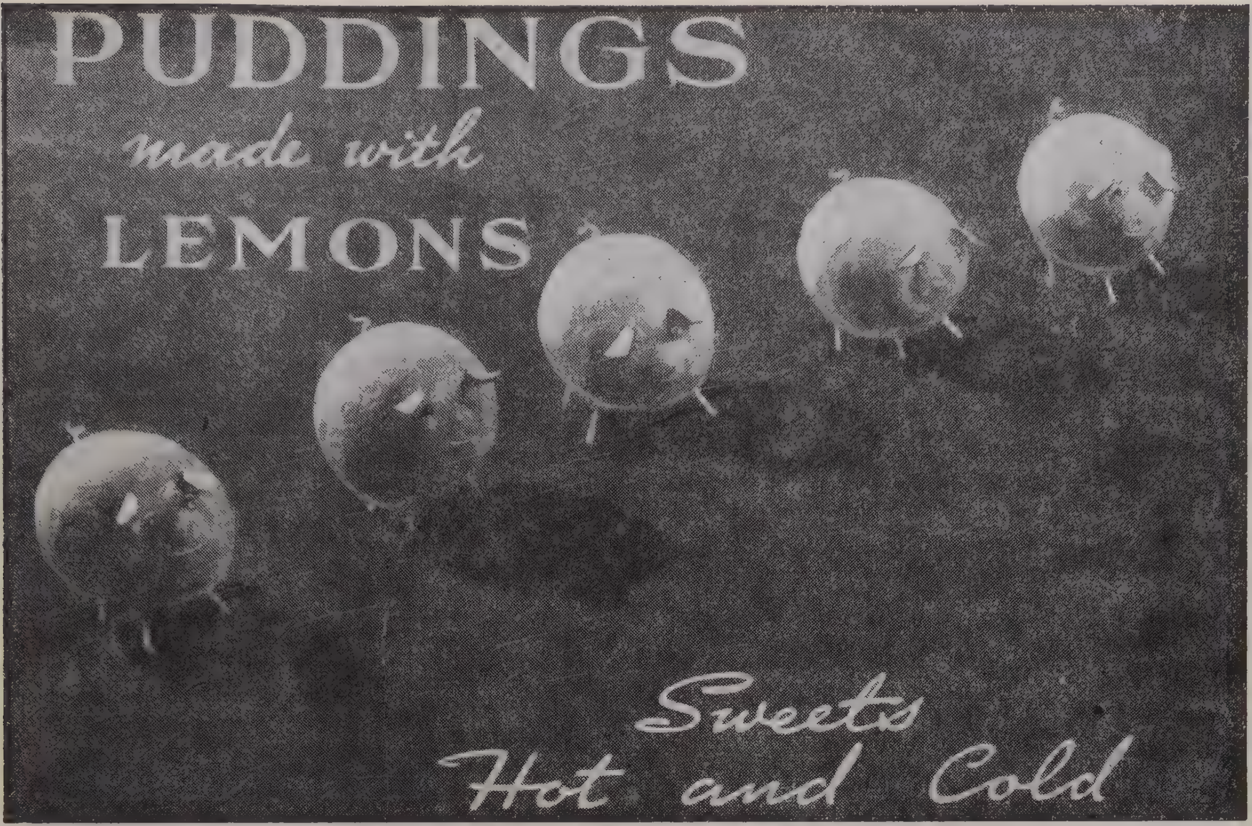

PUDDINGS made with LEMONS

Sweets Hot and Cold

By EVA TOPPING, *Rural Sociologist, Auckland.*

LEMONS can provide an easy solution to the pudding problem, and housewives, particularly those with a lemon tree in the garden, will find the recipes given in this article helpful in preparing menus. Some of the recipes economise in eggs and some in the butter ration; some are for serving hot, and others can be made the previous day for serving cold.

Baked Puddings

Lemon Cheese Sponge

Take one large lemon, grate off all the rind, removing none of the white pith, squeeze, and strain the juice. Cream 2 tablespoons of butter with 1 cup of sugar, add 2 egg yolks, and beat thoroughly. Gradually beat in 2 tablespoons of flour and the lemon rind and juice. Add 1 cup of milk, a little at a time, while continuing to beat. Whisk the 2 egg whites very stiff and fold them into the first mixture. Pour into a buttered pie-dish or oven glassware dish. Bake in a moderately hot oven (350 to 375 degrees F.) for three-quarters of an hour, standing the pudding dish in a pan of water. The mixture will separate in cooking, forming a lemon cheese base with a light sponge top. Do not let the top become too brown and do not overcook, or the lemon cheese will set.

Lemon Cottage Pudding

1 cup of flour
½ cup of sugar
2 level teaspoons of baking powder
Rind and juice of 1 lemon
1 egg (beaten)
2 tablespoons of melted butter (or mild dripping)
Milk to mix

Sift together the flour, sugar, and baking powder, add the grated rind, beaten egg, and melted fat. Beat well adding the lemon juice and sufficient milk to make a soft dropping dough. The total amount of liquid should be about half a cup. Bake in a shallow dish in a hot oven (400 to 425 degrees F.) for about 15 minutes. Serve hot with lemon sauce.

Lemon Sauce for Pudding

Grated rind and juice of 1 lemon
1 dessertspoon of cornflour
1 tablespoon of sugar
½ cup of water

Put the water, lemon rind, and sugar into a saucepan, bring them to the boil, and simmer gently for 5 minutes. Mix the cornflour with a little cold water, and add the hot syrup. Pour the mixture back into the saucepan and continue cooking it gently, stirring for 3 to 5 minutes, until the sauce is clear and thickened. Add the lemon juice at the last minute before removing from the heat.

Steamed Puddings

Special Lemon Pudding

1 cup of flour
3oz. of suet
Pinch of salt
1 lemon
3oz. of brown sugar
1½ level teaspoons of baking powder
Milk to mix

Chop the suet very finely and add it to the sifted flour, salt, and baking powder. Mix to a stiff dough with milk. Turn the mixture on to a floured board and divide it into two parts, one of one-third and the other of two-thirds. Roll out the larger piece and line a greased pudding basin. Grate all the yellow rind from a large lemon and mix the rind with 3oz. of brown sugar. Put the lemon on a plate or saucer and prick thoroughly all over with a skewer, steel knitting needle, or sharp fork. Put half the sugar and rind mixture into the lined pudding basin, put in the lemon and any juice which may have run out,

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Photograph in heading by Sparrow Industrial Pictures Ltd.

LEMON MERINGUE PIE
MOONSHINE PUDDING

[Sparrow Industrial Pictures Ltd. photos.

and add the remaining half of the sugar mixture. Roll out the smaller portion of suet crust into a round to fit the top of the basin. Wet the edges of the dough and pinch them together. Twist a piece of buttered greaseproof paper over the basin and stand it in a saucepan of boiling water, having the water deep enough to reach half-way up the basin. Steam the pudding for 1½ to 2 hours, and then turn it out on to a plate to serve. Cut into the crust and remove the lemon, which will not be served. The juice escapes from the lemon during the cooking and combines with the rind and sugar mixture.

Plain Steamed Pudding with Lemon Sauce

- 1lb. of flour
- 6oz. of finely-chopped suet
- Good pinch of salt
- 3 level teaspoons of baking powder
- 4oz. of sugar
- Milk to mix

Sift the flour, baking powder, and salt into a bowl, add the sugar and finely-chopped suet, and mix to a stiff dough with milk. Turn the mixture into a greased basin, cover with greaseproof paper or paper and pudding cloth, and steam for 3 hours. Serve with lemon sauce made from the recipe already given.

Lemon Pies

To save time, pie shells can be made on the usual baking day and kept in an airtight tin. They are then ready to be filled when needed.

Roll short pastry fairly thin and line sandwich tins or pie plates. Pinch the edges to crimp them and prick the bottom all over with a fork. Lay a piece of buttered greaseproof paper prepared side down on the pie shell and weight it with crusts of bread. Bake the shell in a hot oven until the pastry is set; remove the paper and crusts, and then bake a little longer to finish cooking. Remove from tin or plate carefully and put on a cake rack to cool.

GOLDEN SYRUP AND LEMON TART

[*Sparrow Industrial Pictures Ltd. photo.*

Lemon Meringue Pie

Pastry (for one pie 9in. in diameter):

- 1 cup of flour
- ⅓ to ½ cup of fat (butter, lard, dripping, or mixture)
- Pinch of salt
- 2 - 3 teaspoons of cold water
- 1 teaspoon of baking powder

Sift flour, salt, and baking powder into a basin. Cut the fat in roughly and rub in with the finger tips. Add water slowly, mixing with a knife until the mixture is just moist enough to roll out. Turn it on to a lightly-floured board and roll it out. Fold the lower and upper edges to the centre, roll out, fold the sides to the centre, and roll out again. Line a sandwich tin or pie plate, cut off the surplus edges, and prepare the pastry for the oven in the manner described previously. Bake in a hot oven (500 degrees F.) for 5 minutes to allow the pie to set, and then bake it at a lower temperature for another 5 minutes or until it is cooked.

Lemon Filling:

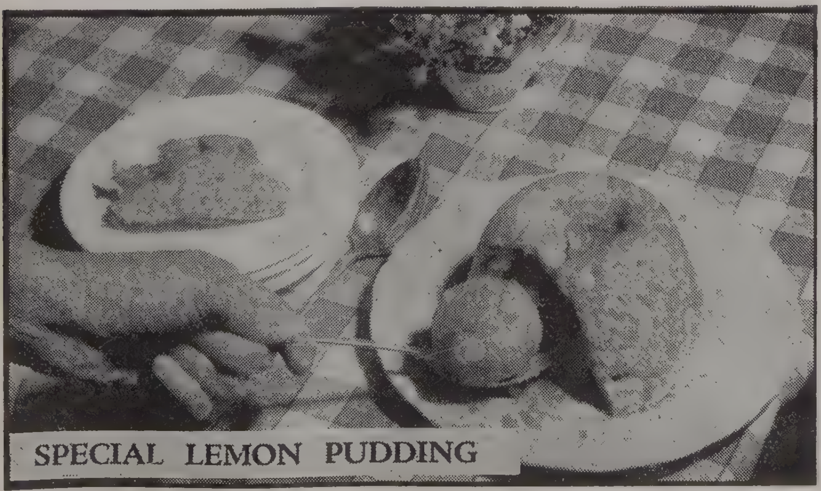
- 1⅓ cups of water
- 2 tablespoons of cornflour
- 2 tablespoons of flour
- ⅔ cup of sugar
- 2 egg yolks
- 4 tablespoons of lemon juice
- 2 teaspoons of grated rind
- Pinch of salt

Put the water on to boil. Mix the flour, cornflour, and sugar together with half a small cup of cold water until the mixture is smooth; mix the egg yolks slightly beaten and add the mixture slowly to the boiling water. Cook for 5 minutes, stirring continually. Remove from the heat and add the lemon rind, juice, and salt. Pour into the baked pie shell.

Meringue Top:

- 2 egg whites
- 4 tablespoons of sugar
- Pinch of salt
- 1 small teaspoon of baking powder

Beat the egg whites until stiff and add sugar gradually, beating well between each addition. Add the baking powder and salt last. Spread the mixture on top of the lemon filling and smooth it with the back of a tablespoon. Bake in a moderate oven (325 degrees) for 10 minutes or until pale



SPECIAL LEMON PUDDING

[*Sparrow Industrial Pictures Ltd. photo.*

PUDDINGS MADE WITH LEMONS . . .

brown. The pie can be served hot or cold.

Lemon Puff Pie

- ½ small cup of sugar
- 2 egg yolks
- 2 tablespoons of hot water
- Juice and rind of 1 lemon
- 2 egg whites
- ½ small cup of sugar
- Pinch of salt
- ½ teaspoon of baking powder

Combine one lot of sugar, egg yolks, and hot water, and cook over boiling water until the mixture is thick. Then add the lemon rinds and juice. Beat the egg whites until stiff and dry, and gradually add the other quantity of sugar, baking powder, and salt. Combine the two mixtures, mixing thoroughly. Put it into a baked pie shell and cook in a moderate oven (350 degrees) until it has set and is very slightly browned. Serve hot or cold.

Golden Syrup and Lemon Tart

Line a sandwich tin or pie plate with pastry and prick the pastry over the bottom. Cover with 1 cup of soft breadcrumbs. Squeeze the juice of 1 lemon over the crumbs and pour on 3 tablespoons of golden syrup. Cut strips of pastry and arrange them on top of the mixture in lattice or other pattern.

Bake in a moderate to hot oven until the pastry is lightly browned. Syrup burns very readily, so the pie should be carefully watched to prevent scorching.

Cold Lemon Sweets

Moonshine Pudding

- 2 tablespoons of cornflour
- 1 cup of sugar
- 2 egg whites
- 2 cups of water
- Pared rind and juice of 2 medium-sized lemons

Blend the cornflour with a little of the water to a smooth cream. Put the rest of the water into a saucepan with the thinly-pared rind of the lemons and bring it to the boil slowly. Strain out the lemon rind and pour the liquid back into the saucepan. Put in the sugar, and heat it until dissolved; then pour in the cornflour mixture and cook 10 minutes, stirring constantly. Remove the pudding from the heat and add the strained lemon juice. Leave it to cool slightly while the egg whites are beaten until stiff. Beat the whites into the mixture and pour the whole into a serving dish.

Make the yolks into a firm custard with 1 dessertspoon of cornflour, 1 tablespoon of sugar, and ½ pint of milk. Pour it into another serving dish, and set the pudding and custard aside to cool.

Lemon Whip

- ½ cup of lemon juice
- ¾ cup of sugar
- 2 egg whites
- 2 cups of water
- 2 level tablespoons of gelatine (1oz.)

Soak the gelatine in half a cup of the cold water. Heat the rest of the water with the sugar, pour it on to the soaked gelatine, and stir until the gelatine has dissolved. Add the lemon juice. Beat the egg whites until stiff and fold them into the lemon mixture. Pour the mixture into a wet mould and leave it to set. Make a custard sauce with the egg yolks, 2 cups of milk, 1 tablespoon of sugar, a pinch of salt, and a few drops of vanilla essence. Beat the yolks slightly, add the sugar and salt, and stir gradually into the hot milk. Cook over boiling water for 5 minutes, stirring continually, and taking care not to allow the custard to boil, or it will curdle. Add vanilla when the sauce is removed from heat and cool quickly.

THE MENACE OF TUBERCULOSIS

THE initial menace of tuberculosis lies largely in the fact that a person can appear perfectly healthy, feel quite fit, and yet have the disease, states an officer of the Department of Health. Tuberculosis does not advertise itself in the early stages. Not many years ago any mention of tuberculosis was made with hushed tones and head-shakes, but that day fortunately has gone forever. Though it is true that, found in its advanced stages, tuberculosis can seldom be completely cured, if it is discovered early, and the proper treatment begun at once, it is one of the most curable of all serious diseases.

Disease Not Hereditary

Contrary to widely-held belief, tuberculosis is not hereditary, though it can be transmitted from person to person. Because a father has T.B., it does not necessarily follow that his child will also have the disease, or because a mother loses her life as the result of tuberculosis, there is no reason why her children cannot be perfectly free from the disease. Of course, continual contact in the home with a tubercular parent will expose a child to the infection, a risk which might be shared equally with anyone else.

The inroads made by T.B. are still serious. Though death rates have decreased under modern knowledge and treatment, it is still the greatest killer between the ages of 15 and 45, the most productive years of life. The value of the X-ray equipment used to detect tuberculosis can therefore be appreciated. An X-ray examination gives the "yes" or "no" to a person's doubt.

Many healthy people are wise enough to get X-rayed, and this should be encouraged to the fullest extent. It is only by everyone making sure that they have not contracted T.B. that individuals, families, and communities can be properly protected.

Early Discovery Important

Early discovery of the disease is vastly important for the following reasons: First, the individual can be put under treatment in time to save his life; secondly, the time of treatment is shorter and therefore less expensive; and, thirdly, those who may be spreading tuberculosis among others can be rendered non-infectious.

New Zealand is well up with other countries in the care of tuberculosis. In fact, there is hardly a person who does not know someone who either has been cured or is on the way to being cured of this disease. On the other hand, there may be some who know of someone who died of it in spite of treatment. If so, it is fairly certain that tuberculosis had gained a strong hold in the victim's body before any medical advice or treatment was sought. For your sake and the sake of those around you do not make the same mistake. Treatment must start early.

ARCADIA

FORTUNATE indeed are the mortals who have found Arcadia. For most of us it remains a secret desire we dream about and hope to see consummated in the future, or else we accept our surroundings and by creating a home and garden keep our dreams inside our own fences.

I love hills and trees and sea, yet I live on the flat with a restricted view and many miles from the coast. Some days I have an aching longing for the hilltops where freedom ranges in the winds of heaven; another time my wish is to flee from the plains and wander at will in the cool bush glades; on other days my soul clamours for the tang of the sea and its ever-changing moods. I would like to live among the hills a short distance up the sunny side of a wide valley. There in a long, low house among trees of all kinds, I would have an incomparable view, and the house being built on the frost-free line would have a garden with "every flower that blows." Away to the left in the upper part of the valley a rampart of mountains would stand guard; to the right the fertile land would spread down to the coast and in the evenings lights would spring up in the many farm homes.

Perhaps I want too much, but had we no dreams life would lose its savour and be a sorry affair indeed.

—"Cloudy," Ashburton.

Weeds need not make Hard Labour in the Flower Garden

WEEDING is a necessary part of home gardening, but it need not be the burden that some gardeners allow it to become. An understanding of the principles of weed control, described in this article by J. P. Hudson, Horticulturist, Wellington, will help to make this work less irksome.

THE gardener who waits until beds and borders are overgrown with weeds before setting to work on them can never hope to win the battle and have a weed-free garden; each year his ground becomes weedier and weedier. Only by attacking weeds while they are small can they be brought gradually under control and become less of a nuisance. A study of how and why weeds appear and how they multiply explains this apparent paradox and shows why some gardeners make weeding unnecessarily hard by doing it either at the wrong time or in the wrong way.

Where Weeds Come From

Weeds grow mainly from seeds or pieces already in the soil and from seeds brought in from outside.

Every fertile soil contains some weed seeds, but in gardens which have at some time been neglected the seed population may amount to several thousands in each square foot. The seeds are usually well distributed by cultivation throughout the depth of soil, and many are so small that they are difficult to see with the naked eye. A careful search with a magnifying glass among a thin layer of dry soil spread over a sheet of glass will usually reveal plenty of seeds, some of which may be identified from the series of enlarged drawings of weed seeds which have appeared in the "Journal of Agriculture."

Seeds germinate only when they are in the surface layers of the soil, but many have a long life and those which are deeply buried may remain dormant for years until they are brought to the surface, when they germinate and grow. The classic example of that was the profusion of poppies which grew in Flanders when shelling and trench digging disturbed the soil, bringing hosts of deeply-buried seeds to the surface, where they could germinate.

Another source of weeds is from pieces of root stock, bulbs, or other underground organs left in the soil by a previous generation of weeds which may have died down naturally or been cut off without the parts below the ground being removed. They are usually relatively short-lived and die at any rate in a couple of seasons if they are not allowed to grow leaves.

The third source of weeds is from seeds, pieces of root stock, and other material brought in from outside, especially in the soil around the roots of plants. That is how oxalis, bindweed, and couch grass have often been introduced into gardens, and home gardeners and nurserymen have a responsibility not to distribute undesirable weeds in that way. Animal manure can also be the means of introducing many weeds into gardens, though the advantages of having such material far outweigh that disadvantage.

Finally, Nature herself is constantly engaged in scattering seeds of a wide range of species in many ingenious ways. Battalions of dandelion and thistle seeds are literally parachuted into gardens every summer, and birds are responsible for scattering the seeds of many berried plants, including blackberries.

Seven Years' Hard Labour

Seeds distributed through the soil by cultivation may germinate at intervals for years as future operations bring them to the surface. It has been truly said that "One year's seeding means seven years' weeding"—though 70 years might have been nearer the mark. When that longevity is coupled with the astonishing number of seeds which one plant of some of the commoner weeds can produce—5000 for a well-grown plant of shepherd's purse, 12,000 for a dandelion—it is clear that weeds should never be allowed to go to seed.

[Photo News Ltd. photo.

Annual coreopsis, which can still be sown outdoors or, preferably, planted out from boxes, makes a splendid cut flower which lasts well in water.

However, it is not so widely realised that many weeds will ripen their seeds even though the plants are cut off or dug in while still only in flower.

The same thing can happen if they are put on the compost heap unless it is carefully made and heats up efficiently. Moreover, weeds left to grow to maturity will have been in competition with the garden plants for supplies of food and moisture for far too long. There is no virtue in letting weeds grow as a source of green crop for turning in or composting, as there are other far more efficient plants to use for this purpose.

From every point of view it is best to kill weeds while they are young, and the younger the better. Apart from any other consideration, pulling or cutting off a small seedling is much quicker than trying to disentangle a large weed and pull it out without damage to the flowers in a border. Observant gardeners, who can recognise weed seedlings from the appearance of their seed leaves, can quickly run a hoe or cultivator through the flower beds whenever the weather is warm and dry, severing the young weeds just below the surface. Seedlings so treated will normally die, as the top is too small to reroot and the tap root of most seedlings cannot produce a new shoot. However, seedlings dragged out by the roots by a blunt hoe will often reroot, especially if a shower of rain falls afterward.

Dahlias should be staked in plenty of time, not later than when the new growths are about 1ft. high. The stakes should be a few inches shorter than the dahlias will be when fully grown, so that they cannot be seen later in the season.

Another advantage of frequent hoeing through the beds, whenever soil conditions permit, is that the surface is kept in a state of tilth which to some extent encourages the germination of weed seeds, especially in showery weather. These seedlings are killed when the bed is next hoed and the weed seed population in the soil is thus reduced gradually.

If for any reason weeds have grown to flowering size before they can be attacked they should always be hand pulled, taking care to pull the roots of each and not just to snap off the plants at or just above soil level. That requires a certain amount of knack, especially with plants like chickweed. but roots left in will usually produce another plant. To hoe off weeds and leave them lying on the ground is useless unless the weather is very hot and dry—good "weed-killing weather" —and even then it is often surprising how many of the plants manage to survive and reroot. If the weeds are showing flower they are best burned to avoid any risk of seeds ripening in the compost heap. Composts are a valuable aid to maintaining the fertility of the home garden, but this is one type of plant material best not used for composting.

Perennial Weeds

Couch grass, oxalis, bindweed, creeping thistle, and other weeds with underground systems which live from year to year and produce new shoots from below the surface present a different problem. In eradicating weeds of this type the principle must be never to allow new growths to develop. The food stored up in the root systems enables the plants to form a succession of new shoots, but the production of each one of these uses up a little of the stored food.

If a new shoot is allowed to grow more than an inch or two high, it will manufacture food and pass it back into the underground parts for storage, thus further strengthening its hold on the soil. If the shoot is cut off shortly after it appears, however, the root stock will have been weakened slightly and if the new shoots are unfailingly cut off as they appear, the underground system will ultimately die out altogether.

Perennial weeds can be and have been eradicated completely from infested gardens, but only by constant application of these two rules: Pick out of the soil and burn all underground parts whenever the soil is cultivated, and never let shoots develop, chopping them off with a hoe whenever they appear.

Chemical Weed Control

Great advances have been made in the use of chemicals for the control of weeds, but almost all the proven treatments apply to field crops. Chemical weed control among growing plants in the flower border presents a most complicated and difficult problem which has not been solved so far.

It is not likely that chemical weedkillers will be of much help to the flower gardener except, possibly, for killing bindweed (convolvulus) among shrubby plants and for the control of lawn weeds, for which several chemicals, including weedkilling hormones, can be used with excellent results.

Garden Work for November

Annuals can still be sown if the soil is not too dry, but late-sown seedlings often germinate unevenly and make poor growth. If it is foreseen that the garden will be short of colour in the late summer (a common failing in New Zealand home gardens), orange and yellow calendulas should be sown now in a box, the seedlings pricked out into other boxes as soon as they can be handled, and then planted out early in the New Year. The young plants may then need puddling in if the soil is dry but calendulas are fairly tough and can stand a certain amount of hot, dry weather. These plants will make a vivid display in late summer and on through the winter unless growth is stopped by very cold weather.

Bedding plants such as viscarias, nemesias, petunias, marigolds, salvias, stocks, and asters can still be planted out as described last month, but they should be puddled in if the soil has begun to dry out. That can be done in one of two ways: A hole can be dug for each plant, the hole filled to the brim with water, and the plant then planted. Alternatively, they can be planted but with only part of the soil returned to the hole, leaving a basin-shaped depression. Fill this to the brim with water, wait for it to drain away, refill once or twice, and then an hour or so later return dry soil until it is level with the surrounding surface. Whichever system is followed the soil must not be firmed, handled, or worked while it is still sodden or its physical condition will be ruined and it will be turned into mud, which will set hard when it dries. A thin layer of sieved compost scattered over the surface between late-planted bedding plants helps to keep the soil cool and moist.

Biennials such as wallflowers may be sown in a seed-bed in some odd corner of the garden in late, cold districts where plants have to be bedded out in early autumn, but it is too early to sow them elsewhere.

Bulbs of the early spring-flowering varieties will now be getting past their best and the leaves becoming untidy and a nuisance. Though there is nothing ornamental about the leaves at this time of the year, next year's flower buds will depend on the plant foods which the leaves are now manufacturing and passing down to the new bulbs for summer storage. It is a mistake to remove the leaves of narcissi, belladonnas, hyacinths, and other bulbous plants until they have changed colour and started to die down. Bulbs like hyacinths and tulips, which are best lifted every year, can be carefully dug up with as many roots as possible after flowering and heeled in in some odd corner of the garden where the leaves can complete their function and die without being an eyesore. Narcissi need be lifted only every third year or so, and belladonnas and many other bulbs are best not disturbed at all. In these cases it may be essential to remove some of the foliage if it is smothering nearby small subjects, such as recently-planted bedding plants, but as little should be removed as possible and the remainder left to die down naturally. The method of twisting narcissus leaves into a knot after the plants have flowered is not very becoming, but it is better than cutting them off for the sake of neatness and at least helps to prevent them from flopping over on to neighbouring plants.

The flowers should be picked off rhododendrons as soon as they fade and before seed pods can develop.

Cinerarias thrive in a semi-shaded place and make a bright display of colour in early summer. A watch should be kept for "woolly bear" caterpillars, which eat holes in the leaves and can soon ruin the plants. They can be controlled by hand picking the dark-brown caterpillars, which are quite conspicuous, or by spraying with lead arsenate.

Chrysanthemum planting should now be concluded, even in the latest districts, by setting out well-rooted plants of the border varieties. Before being planted the soil should be dug over and enriched with a dressing of compost and a complete fertiliser. The mixture referred to under "violets" in last month's "Journal" will ensure well-balanced growth.

Dahlias are frost tender and should not be planted out until all danger of frost is past, November being the proper month for planting dahlias in all the districts where late frosts are likely. A hole should be dug for each plant sufficiently wide and deep to enable it to be put in with the surface of the ball of soil (if a rooted cutting is being planted) or the top of the tuber 2in. below the original soil level. Press the soil reasonably firmly round the ball of soil or tuber, but leave a depression around each plant to enable it to be watered if a dry period follows planting.

Fuchsias will benefit from a top-dressing of compost or old animal manure applied to the surface of the bed in early summer to keep the soil in good condition.

Gladioli will now be growing strongly in the early districts and thought should be given to staking them in gardens where strong winds can be expected. An individual stake pushed in behind and an inch or two away from each plant is the method usually followed, each spike being tied loosely to the stake. The earlier gladioli are not usually attacked by thrips, which become much more troublesome later in the summer.

Hedge trimming can start as soon as new growth makes the hedges look ragged and untidy. The succulent young shoots cut off at this time of year should all be put on the compost heap, where they will help harder material to rot down. Some home gardeners have a good eye for a straight line, but the appearance of a large proportion of garden hedges makes it quite obvious that many have not. Yet nothing looks more untidy than a hedge with a wavy outline. To facilitate straight clipping a line should be tied at each end to a rod thrust into the ground, or through the hedge, and tethered back to pegs in the ground so that the line can be pulled taught and straight.

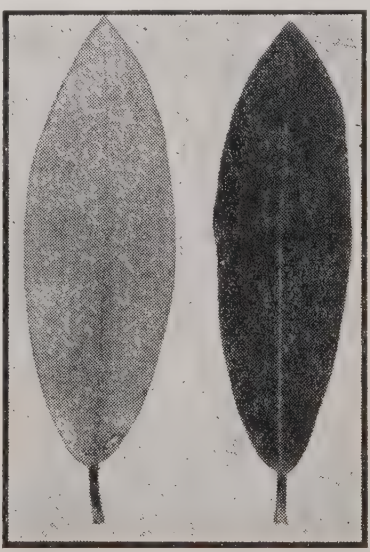
A horticulturist from overseas who toured New Zealand recently said that the general standard of hedge clipping and maintenance in Invercargill was the highest he had seen anywhere.

Hydrangeas should be mulched with a layer of well-rotted manure, compost, or leaves, especially where the bushes do not themselves provide a continuous ground cover, to conserve the moisture in the soil and prevent the sun from overheating the surface layers. The colour manipulation of hydrangea flowers was described in the January, 1947, issue of the "Journal." Though winter treatment is the basis of the manipulation, the blue colour of certain varieties can be greatly intensified by dissolving 1 teaspoon of alum or 3oz. of aluminium sulphate in each gallon of water, allowing the solution to stand for 12 hours, and then watering the plants thoroughly with it in early summer. This treatment should be repeated at intervals of 10 to 14 days if it is seen to be producing the required results.

Lawns will now require mowing frequently. The lawn mowings should always be removed and used as a surface mulch on flower borders or put on the compost heap. Research has shown that is not a good practice to leave the mowings on the lawn, quite apart from the importance of making the best use of this valuable type of organic material elsewhere in the garden. Hormone weedkillers give good results on lawns only when used in warm weather. The greatest care should be taken not to allow drops of the spray or spray drift to fall on plants in the flower borders, and the syringe or spray should not be used for any other purpose until it has been thoroughly washed out and the leather washers replaced.

Polyanthus flower heads should be picked off regularly as they fade and the plants divided up when they finish flowering. Lift each of the clumps marked earlier as being worth increasing, shake out soil from the roots, and pull each plant into a number of separate crowns. Each of these, which should be well supplied with roots, is then replanted firmly with the base of the lowest leaf level with the top of the soil. The crowns can be planted in a bed in the vegetable garden to grow on through the summer and then be transplanted back into the flower border to flower next spring. Alternatively, they can be replanted directly into their flowering position along the edge of the border. In either case the ground should be dug over and 2oz. a square yard of the complete flower border fertiliser worked in before planting to ensure sturdy plants for flowering next year.

Pot up a few rooted chrysanthemums (three in a 5 or 6in. pot) and geraniums and pelargoniums (single plants in 4 or 5in. pots), using the John Innes potting composts described in the July issue. These plants should be stood in a sunny place and grown on through the summer to be taken into the house as pot plants when they come into flower. Established pot plants which are already growing strongly should be fed every 10 to 14 days, as described in last month's "Journal."



Rhododendron leaves attacked by thrips become covered with a silvery scurf, as shown on the left-hand leaf. The leaf on the right is normal.

Stakes should now be got ready for use as required in staking dahlias, chrysanthemums, herbaceous plants, and other subjects requiring fairly stout, strong stakes that will stand being driven well into the ground. Sawn hardwood stakes, 1in. square and about 4½ft. long, are expensive to buy but are so durable that they will prove a good investment in the end. They are least conspicuous if painted dark green, and will usually last for several seasons if stored in a dry shed during the winter. Smaller stakes, up to 18in. long, for the taller annuals, bedding plants, and short herbaceous plants, can often be made by selecting straight-grained boxwood ⅜in. thick and splitting it down into strips ½ to ⅜in. wide. These will last only one season unless creosoted but are inexpensive and quite satisfactory for staking the lighter plants.

Violas produce the largest flowers on young plants, but even on old plants the size of flower can be greatly increased by picking off the flowers as they fade and preventing the formation of seed pods, which absorb so much of a viola plant's strength that it cannot also produce large flowers.

Wallflowers should be pulled out as soon as they have passed their best to make way for the summer bedding plants. That must mean some sacrifice of flowers, but is better than delaying planting and allowing the bedding plants to become starved in their boxes. The wallflower is a true perennial, though it is usually grown as a biennial. In mixed borders a few plants can now be cut down hard instead of being pulled out, and these will usually give a display of wallflowers throughout the autumn and winter in all but very cold districts.

Reminders About Common Troubles

Rhododendrons are often attacked by thrips, which cause the leaves to become covered with an unsightly silvery scurf. If the bushes show signs of this damage, spraying them is well worth while, using a nicotine sulphate spray, which can be made much more effective by adding 1 per cent. of summer oil emulsion. To make up this spray add ½ fluid ounce (1 dessertspoon) of nicotine sulphate to 2 gallons of water. Then mix 3 fluid ounces (3 tablespoons) of white summer spraying oil emulsion with a small quantity of water, stir it thoroughly, and add it to the original mixture.

This nicotine-white oil spray is a most effective insecticide which gives very satisfactory controls of many pests. To be most effective a second application should always be made 10 to 14 days after the first.

Nicotine may be used without the addition of the white oil but it must be "activated" by dissolving 1oz. of soap powder (1 rounded tablespoon)

A GIRL'S WINTER COAT

In the article "A Girl's Winter Coat," published in the July issue of the "Journal," it was stated in the section on adjusting the hem that the hem was to be cut away behind the facing. **For children's coats which will need to be let down the hem should not be cut away. Extra pressing will be needed at this point when the coat is made of heavy material.**

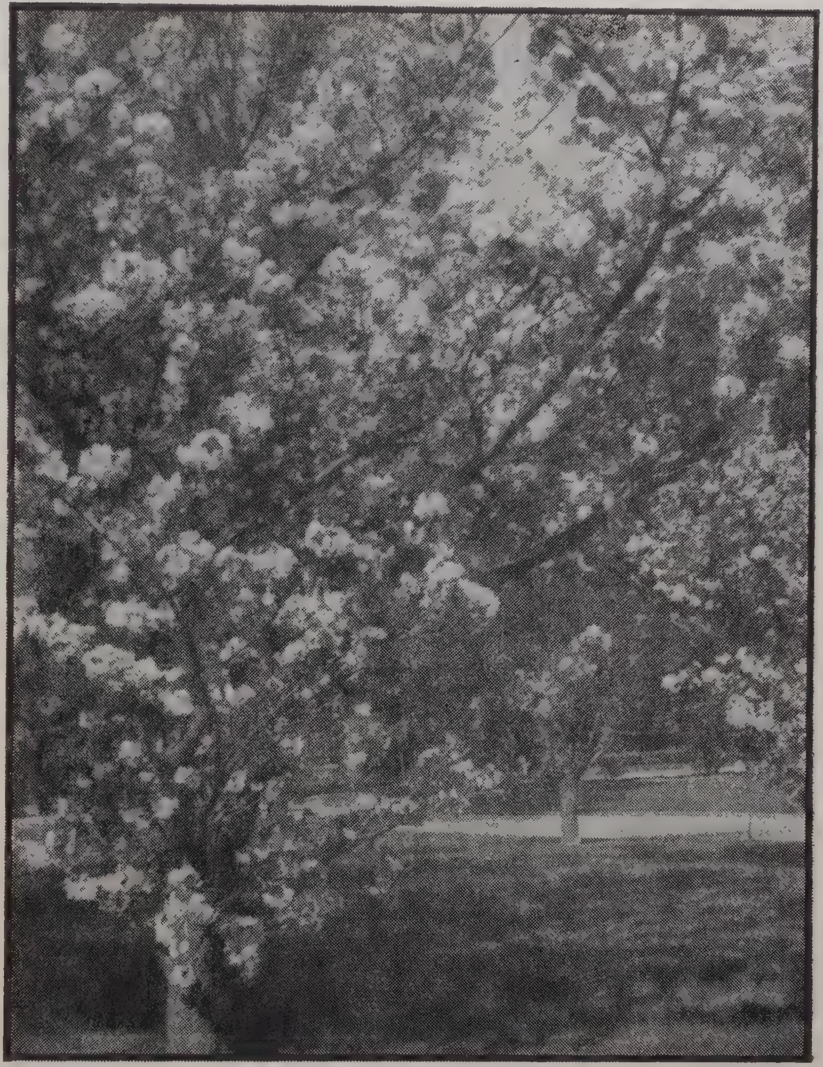
in hot water and adding it, with ½ fluid ounce of nicotine sulphate, to 2 gallons of water. This spray is most effective when used in warm, sunny weather.

Escallonia hedges in recent years have become susceptible to attacks of silver blight (caused by a fungus, *Stereum purpureum*), which has been recorded from several districts on the common *Escallonia exoniensis*. This is a popular hedge plant, which has been widely planted because of its neat habit of growth and general suitability for garden hedging, but the effect of silver blight is to cause plants here and there in the hedge to die out completely and so leave a most unsightly gap which may take years to refurnish.

Because of this susceptibility to disease *Escallonia exoniensis* can no longer be regarded as an ideal hedge plant. Silver blight has also been recorded on *E. macrantha*, which has larger leaves and reddish flowers and has also been widely planted as a hedge. *Lonicera nitida* is a hedge plant not susceptible to attack which can be strongly recommended for garden hedging.

Silver blight usually attacks bushes through open wounds and is especially likely to occur on hedges which have been cut back hard, leaving large branches with cut ends. The leaves of affected branches turn bright yellow, a conspicuous symptom of the disease on escallonia. Later the affected bushes die, branch by branch or outright, depending on the place of attack. The fungus does not produce spores until after the branches have died, when the well-known purple-coloured fruiting bodies appear, looking like wrinkled pieces of leather stuck to the bark. Myriads of spores are produced from these fruiting bodies and blown about on to healthy plants, which can become infected if the spores alight on an open wound.

Though there is no way of curing a bush which has this disease, much can be done to prevent its appearance on escallonia by clipping frequently to avoid the need for wounding larger shoots, painting over the end of any thick branches which may have to be cut, and, above all, **cutting out and burning dead branches or bushes before the fruiting bodies have time to form.** This should be coupled with general garden hygiene and the destruction by burning of all old dead branches of other trees in the garden.



Flowering cherries, which add much to spring flower displays, are sometimes attacked by silver blight disease. Keep a careful watch for dead branches and ruthlessly cut them out and burn them. Dead branches left in the trees are the most likely source from which further infection can spread.

Walnut blight, caused by a bacterial organism (*Bacterium juglandis*), occurs every season but in some years does far more damage than in others. Though all parts of the shoots may be attacked the symptoms are most often first noticed on the leaves, which show very numerous small angular spots dotted over the whole surface, including the veins and stalk. Large black spots occur on the nuts, which may drop while small or be worthless even if they remain on the tree, and small, elongated, black blotches are produced on the surface of the young twigs and buds, many of which may die outright.

Though the twig and bud infections are not particularly noticeable they are most important, as it is from them that the new leaves and fruit are infected in the following season. The disease spreads rapidly in the spring, especially in periods of wet weather. Because of the difficulty of access to infected parts this disease is not easily controlled on large trees. It is always worth while, however, to cut out and burn dead branches and any dead twigs that can be reached, as it is from these that infection spreads. It has been said that liberal dressings of sulphate of ammonia and superphosphate, applied in the spring, help trees to withstand attacks of blight in Tasmania, but there is no evidence of the effectiveness of fertilisers in New Zealand.

When spraying their fruit trees Tasmanian apple growers are said to spray as much of their walnut trees as they can reach, using the same spray as is applied to apples at the green tip and pink bud stages and applied at the same time. That is reported to have resulted in a great reduction in blight and a much-increased crop, and apple or pear growers with walnut trees growing near their orchards might well follow this suggestion.

SEWING PLASTIC MATERIALS

By EVA TOPPING, *Rural Sociologist, Auckland.*

BRIGHT, colourful, plastic materials displayed in drapery and soft furnishing stores offer a new medium to the home seamstress. They present a challenge, too, as the methods of cutting out and constructing articles from them are slightly different from the usual sewing practices. This article offers some hints and ideas for using and sewing these plastic films.

[*Sparrow Industrial Pictures Ltd. photo.*

PLASTICS which are obtainable by the yard are transparent or semi-transparent and have a smooth, glossy finish. They are waterproof, non-porous, and shed dust easily; they require no ironing or pressing and can be cleaned quickly by wiping them with a damp cloth. In a warm, steamy atmosphere they may become softer and stretch more easily; in extreme cold they tend to stiffen and sometimes to crack. They are inflammable, but not more so than many of the usual fibre materials. Under average conditions and with reasonable care they are very satisfactory, and undoubtedly they are labour saving.

Uses for Plastic Materials

For articles which are required to repel water, such as shower curtains, sponge bags, raincoats, and wet weather hoods, plastic films present an attractive and practical medium. Bathroom and kitchen curtains, which are subjected to steam, soon become limp and need laundering or ironing; made of plastic, they will keep their crisp lines no matter how damp they become. Water splashes from the bath or soap suds from the dish washing are easily wiped off, leaving the curtains as fresh and spotless as when new.

The pretty petticoat dressing tables and stools which are much in favour at present can be dressed in plastic materials. Then the dust which inevitably gathers on the flounces is easily brushed off, finger marks or other stains are removed in a twinkling with a damp cloth, and one job of washing and ironing is avoided.

Mothers of young children will find many uses for plastic materials—as feeder sets of bib and table mat for the "learning-to-feed-himself" stage of growing up; as bags for soiled napkins when travelling with the baby; as an apron for dodging a soaking at the daily "splash sessions" of the toddlers.

Tray cloths, table mats, tablecloths, and shelf linings are other ways of using these new materials. The designs are many and varied, so suitable patterns and colours for all kinds of articles are easy to find. Lamp shades of plastic film are also being shown, and the paler colours in light designs are decorative and practical.

In making up plastics it is necessary to use and handle the material correctly to produce articles that will give long wear and look attractive.

When the films leave the manufacturers they are rolled on cardboard tubes to prevent creasing, but they have to be folded before being parcelled when sold. They should not be left in the parcel longer than necessary. Shake out the length bought and hang it over an open door with the ends even on both sides. Smooth out the wrinkles and folds with the hands, slightly damping any obstinate creases.

Cutting Out

Plain plastic films may be cut in any direction, as there is no grain to follow. With a patterned piece the design must be considered, and then the paper pattern must be placed so that the design is in the right position on each section of the article being made. The paper pattern pieces should not be pinned to the plastic, as the pins would leave small holes which would weaken the film at those points. Weights can be used instead, and pennies will be found just heavy enough to keep the filmy pattern pieces in place.

Trace round the outlines of the pattern with a soft pencil and also make the markings for joining seams and the positions of pockets, gathers, and so on. The pencil marks will wipe off quite easily with a damp cloth when the article is finished. Use paper clips to keep each pattern piece with its corresponding section of material. Lay the cut pieces flat on a table or hang them over the open door or other straight edge, such as a small clothes horse or towel rail.

Basting

Plastic films should not be basted in the usual way with needle and thread, as a row of holes would be made. Paper clips can be used to keep two edges together for a plain single seam and to hold pleats in place. At points where paper clips cannot be used small pieces of gummed paper will keep the edges in place while they are stitched and are easily removed by damping them slightly. Stamp edging, stamp collectors' hinges, pieces of gummy labels, or the transparent tape used for mending music would all serve the purpose. The adhesive on the paper may gum up the machine needle, so stitch as closely as possible to each piece, remove it, then continue stitching.

Machining

For stitching plastics use a fine machine needle and mercerised thread. Use a loose tension and a long stitch; that is very important, as a short stitch with tighter tension makes too many holes and the thread cuts into the material, which tends to tear at the line of stitching.

[Sparrow Industrial Pictures Ltd. photo.

The apron is in smoke-grey and blue with a red seahorse design. The large waterproof bag is of scarlet material with a silver line, and the sponge bag of yellow trimmed with scarlet.

To end off, stop the needle a stitch-length or two from the edge of the material; do not turn and sew back, but leave long threads and fasten off securely by tying them. It is better not to sew right to the end, or to let the stitching run off the edge of the material, as that will make a small hole from which a tear may start.

[Sparrow Industrial Pictures Ltd. photo.

The raincape and hood worn by the girl in the picture at the head of this article. They are in deep cornflower-blue material with a silver daisy design.

In most fabrics a double seam is stronger than a single seam, but in plastics two rows of stitching should not lie on top of each other, as that weakens the fabric. Most articles can be made with a single seam or an overlapped seam with one row of stitching. If it is necessary to make two rows, they should be wider apart than is usual on other materials.

When a plastic material is being stitched it may drag and cause the needle to stick, so keep the machine oil handy and smear a thin film of oil along the seam and on the plate of the machine. One drop on the finger tip, or a flick with a camel-hair brush or feather dipped in oil, is all that is necessary. The machine should be well oiled and running smoothly. Use some of the clippings and experiment with length of stitch, tension, and the drop of oil before beginning the stitching of the article to be made.

Gathering

Gathering, for such positions as frills or waistlines, should not be done by hand, as the needle will make larger holes in the material than the thread, which will pull out. Gather on the machine by using a very loose tension and the longest stitch; draw up the gathering by pulling the shuttle thread. Gathering can also be done by using the ruffler or gathering attachment of the machine.

The edges of frills do not need stitching. They can be left straight or cut with pinking scissors.

Edgings and Tie Strings

Bias binding or cotton material cut on the cross is useful for binding edges to give a neat and decorative finish. Circular table mats with binding to match one of the colours of the pattern are very attractive. Strings for aprons, feeders, and hoods are better made of woven material, as constant tying stretches and weakens the plastic film.

Do not iron the material, as heat causes plastics to fuse and melt. A very cool iron can be used to press them when necessary if a paper is placed between the iron and the plastic. Plain paper must be used; newsprint will be transferred to the material. Press the material on the duller side to avoid removing the shiny finish on the right side. Try the heat of the iron on a scrap of plastic material, as, even if it is only slightly hot, the plastic may cockle, and it is much better not to press at all than to spoil the finished article by using too much heat.

Raincape and Hood

The gay little set of raincape and hood illustrated was made of deep cornflower-blue material with a silver daisy design. The seams were stitched only once, the top edge being folded and overlapped on to the lower edge. The facings at the front were attached by single seams and the inner edge was not stitched.

The buttonholes were bound and stitched back, well away from the opening, through the side front, binding, and facing in one operation. Circles of cotton material were held in place at the back and on the right side while buttons were attached.

The arm openings were finished with strips of plastic, stitched twice with the rows of stitches ⅜in. apart. A short length of bias binding was stitched in at each end to prevent tearing.

Blue matching binding finishes the hood around the edges and makes the strings.

Apron

The apron has a smoke-grey and blue background with a red seahorse design. The strings at the neck and waist are of matching blue binding.

The ruffles were gathered on the machine attachment and were set on in one operation. The fullness at the waist is regulated by pleats, thus eliminating one row of stitching for gathers.

Large Bag

The upper bag in the illustration would be useful for holding bathing suits and towels or damp napkins. It is made of scarlet plastic with a fine, silver, checked line. The top flaps were stiffened with strips of cardboard inserted in the hems. The finished bag was taken to a soft furnishing department and the brass eyelets, like those used on shower curtains, were put into the stiffened flaps to carry the cord fastening and handle.

Sponge Bag

The sponge bag is of plain yellow plastic decorated with strips of the scarlet material left over from the large bag. Red stitching at the top makes a casing for a scarlet double draw-string.

A Handy Apron Bag

A PERFECT apron bag for keeping knitting or mending clean can be made from odd pieces of material. It is an ideal suggestion for adding to the Christmas gift list.

The apron bag illustrated was made with a plain stripe down the centre of the pocket front and the back and with a plain waistband, but the material can be arranged any way the user prefers.

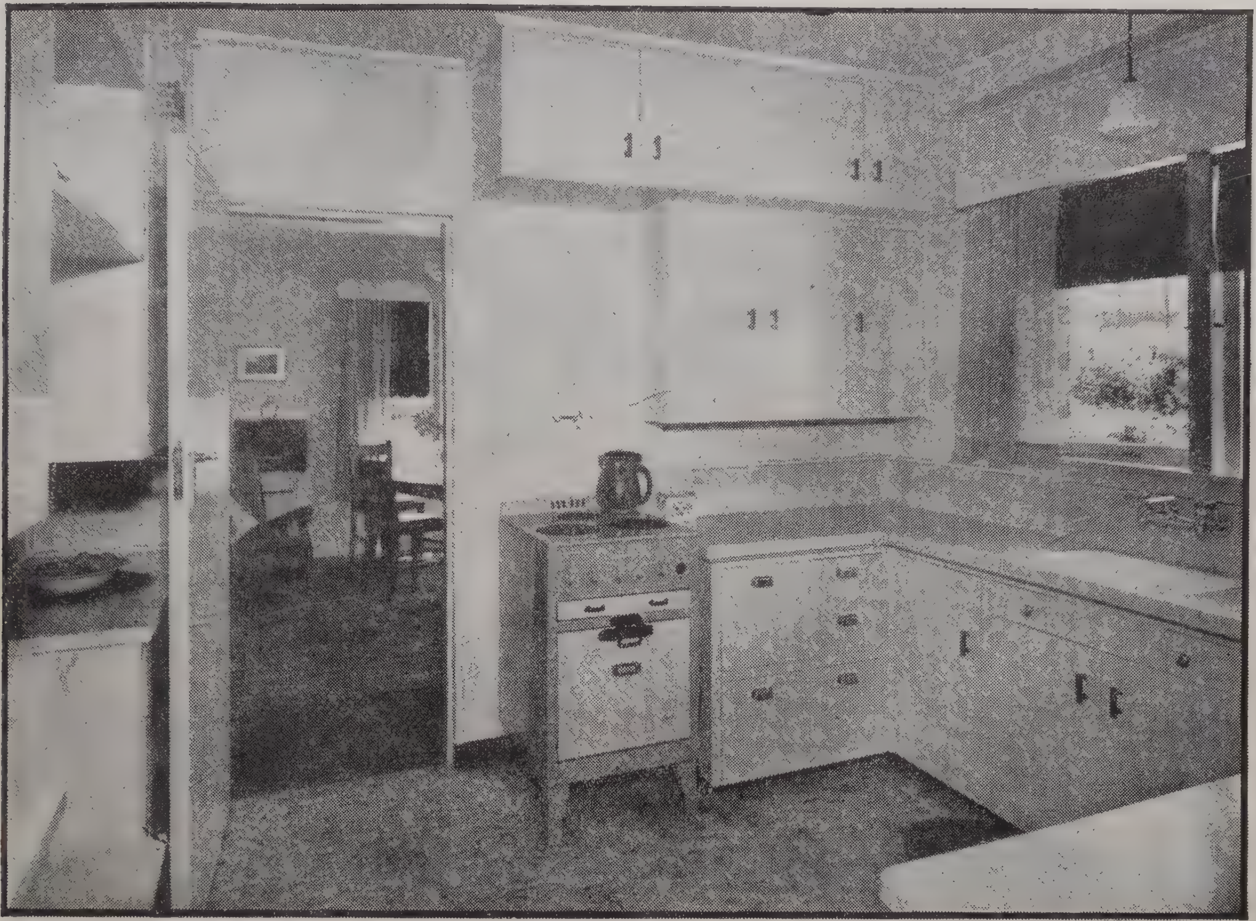
Cut or join the material into the following pieces: For the apron back a piece 6in. by 21in.; for the pocket two pieces each 12in. by 21in.; for an inside pocket a piece 8in. by 6in.; for the waistband a piece 12in. by 3½in.; for the apron ties two strips each 2½in. by 30in., and a 1in. strip 21in. long for casing. In addition, a piece of ribbon 5 yards long and ½in. wide is required.

First lay the two large pocket pieces together and curve off the lower corners. Hem one long side of the inside pocket piece and turn in the remaining raw edges. Place the base of the pocket 4in. from the base of one pocket piece on the wrong side and stitch. Join the apron back to this piece so that the right side of the apron is joined to the wrong side of the pocket. Cover the join on the right side of the apron with a narrow strip to make a casing. Hem the top long straight side of the front pocket piece.

Place the front pocket over the back, right sides together, and join all round. Turn the right side out. Cut off 2¼ yards of ribbon and gather it to fit round the apron. Turn in each side of the apron and stitch the frill along the edge, continuing by stitching the edge of the frill in French seam round the pocket.

Gather up the top of the apron and fit it inside the waistband. Hem the tie strips and join them to each end of the band. Make eyelet holes in the pocket casing and the hem of the front pocket and thread the ties of the remaining ribbon through the casing.

There is plenty of room for a big piece of knitting in the deep front pocket. To make the apron into a bag slip the top and ties into the pocket, pull the draw-strings, and tie.



Experiences in Kitchen Planning

IN letters received by the Rural Sociologists of the Rural Development Division in the course of the recent housing survey there have been many helpful ideas about home planning. They have come particularly from families who have had the experience of building a new house or altering an old one to suit their requirements. In this article Norma K. Metson, Rural Sociologist, Wellington, discusses some suggestions made by various correspondents for kitchen and scullery layout.

MOST comments received concern the kitchen and working areas of the house, which are so important to the housewife, and which are usually the first part of the house to be modernised unless a very small house makes extra rooms a more pressing need. It is interesting to find, also, that in a recent American study of house improvements of farm families in Ohio, published in the "Journal of Home Economics," June, 1947, kitchen cupboards and equipment were the most usual additions. The publication states: "It was evident that some families had let themselves go in remodelling the kitchen. In a number of cases it was easily the most attractive room in the house."

These American families when asked if they had any suggestions to offer others as a result of their experience emphasised, first, the need to plan together everything that is wanted, even though all the work cannot be done at one time, and, secondly, to see as much as possible of what others have done, and learn from them. The following suggestions and comments, which give an outline of the solutions to some individual problems of kitchen layout in New Zealand homes, show skill in adaptation to special requirements. A later article will give an account of general preferences in kitchen design as revealed by an analysis of answers from the housing survey schedules.

Large Kitchens

Provided large kitchens are planned, they need not be step-wasting and barnlike, and may be preferred for several reasons. The first requirement is that all working surfaces and equipment must be compactly arranged at one end so that the housewife can do her work without loss of time and without the annoyance and interruption of cross-traffic, or children and farm workers getting in the way. An additional stipulation is that a room of this type, in use most of the day, and the centre of much family activity, must be sunny, clean, bright, and cheerful in appearance, well ventilated, and adequately heated. One correspondent says: "I find it satisfactory to use my large kitchen as I have planned it for many activities, but I like it kept attractive with frequent repainting and bright washable furnishings. I **don't** mind living in the kitchen; I **do** mind drab surroundings." As shown in Fig. 1, this large room was made from two which were small and dark. Additional windows now give more light and sun,

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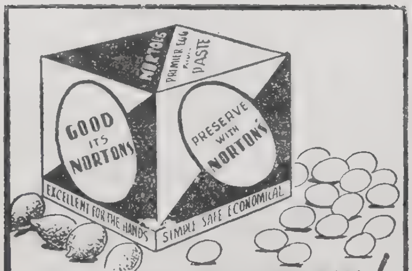
Photograph in heading by Sparrow Industrial Pictures Ltd.



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Rural Housing

ARE you contemplating a new home on your farm or considering alterations to an old one?

Most women have valuable ideas on how convenience and comfort can be combined in the building of, or extensions to, a home. No one is in a better position to observe the shortcomings and to appreciate the sound points in construction than the woman who works and lives in the home. All the many ideas for improving country housing conditions are wanted by the Rural Development Division of the Department of Agriculture, which is carrying out a survey of rural housing, and from this information will prepare a schedule that will be sent to anyone interested. Results will also be summarised in the "Journal."

In addition, with the aid of the information secured from country women, the Department of Agriculture intends to prepare plans which will reflect New Zealand farm families' own preferences. They will, in fact, be plans of country homes designed by country people—people intimately associated with the routine of farm home life.

vey by writing to the Rural Sociologist in your district for a questionnaire. District offices are:—

North Auckland and Auckland: Rural Sociologist, Department of Agriculture, Auckland.

Taranaki, Wellington, Hawke's Bay, Gisborne, Nelson, and Marlborough: Rural Sociologist, Department of Agriculture, Wellington.

Canterbury and Westland: Rural Sociologist, Department of Agriculture, Christchurch.

Otago and Southland: Rural Sociologist, Department of Agriculture, Dunedin.

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T.B.2

and "in summer I can keep either of the outside doors open according to the direction of the wind."

The large room is favoured for the minimum house in which the total floor space does not permit the inclusion of another living room of any size. The economy of furnishing and the heating of only one room are, of course, of considerable advantage in these cases. Heating is a particularly important point in colder districts, and if the kitchen is the only warm room, family living will concentrate there no matter how spacious is the rest of the house. Where there are young children it is essential that they should have a warm and safe place in which to play and where they can be watched without being in the way. The large kitchen gives this extra space in the area used for dining and sitting. A dining alcove can, for example, be converted to a play pen for the baby by placing a simple gate across the front, provided, of course, that it is not in a dark and sunless corner.

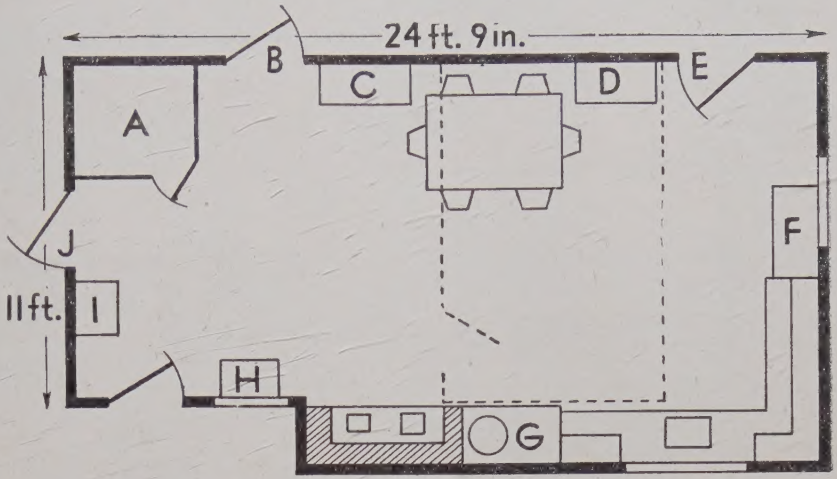

Fig. 1—A cleaning equipment, B door to hall, C built-in desk and storage for papers, D dresser for linen, E outside doors, F bins, G airing cupboard, H sewing machine, I wood box, J door to laundry. The dotted lines show the position of the original walls.

Having a number of men to cater for also appears as a strong reason for liking a large kitchen. Hearty appetites increase the amount of cooking and baking to be done and this in turn, especially in isolated areas, means more storage space for food and utensils. Men generally prefer, too, to sit round in the informal atmosphere of the kitchen, but there is nothing more annoying for the housewife than to have them filling the room and hindering her work; hence the desirability of sufficient seats and space at one end of the room, perhaps round an open fire. The room illustrated in Fig. 2 is, in the opinion of a correspondent " . . . the ideal farm kitchen. It is large and sunny with all the working tools and space at one end, and comfortable chairs at the other. A farm kitchen needs to be large enough to accommodate several men for morning and afternoon tea, buyers, drovers, etc., and also needs comfortable chairs for the farm workers to rest in after lunch."

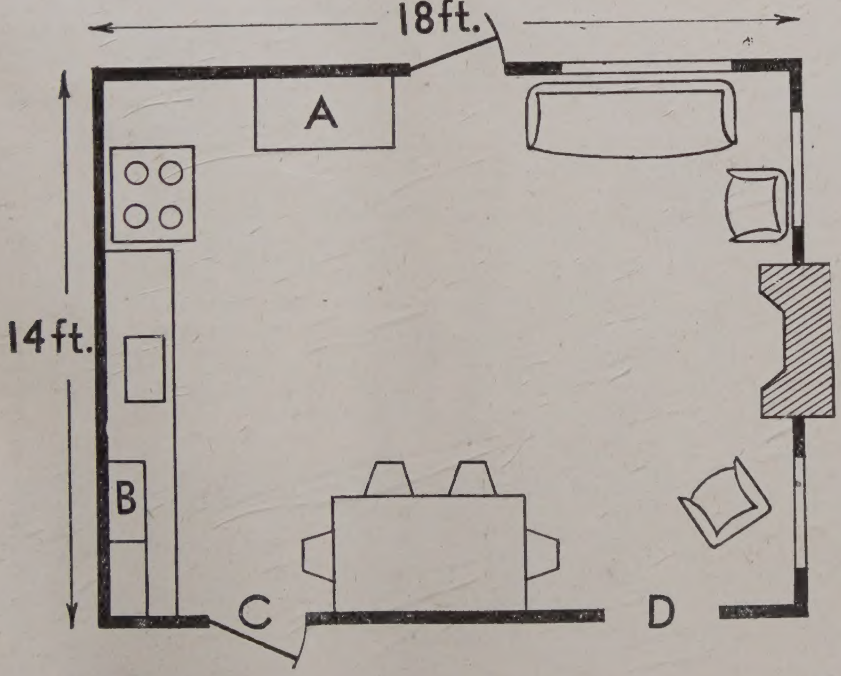

Fig. 2—A bench with cupboards beneath, B safe, C door to storeroom, D archway to small sitting-room.

Small Kitchens

The small, specialised kitchenette or workshop is advocated by those who are accustomed to working alone and who like the evidence of work to be as inconspicuous as possible. In these cases the method of communication between the kitchenette and the room where meals are served is of great importance, as inadequacy in this respect means much extra work. A door between kitchen and dining area is essential, either opening directly or with a minimum of passage intervening. If a pass cupboard or slide is used also, there must be ample bench space or a table on each side for serving. If there are many farm workers, a door opening from the dining area directly outside or on to a porch will allow them to come in without walking through the house.

Divided Rooms

The idea of an area marked off for a special purpose, but not entirely separated from the main room, is introduced in two ways. "We have added a small room 10ft. x 10ft. in the form of an alcove off the kitchen, with an open fireplace and a supplementary water heater round the grate. This we use for sitting in, sewing, and for the children's homework and play. It is a great boon, and I would always advise people building to include one." A sunporch may be used similarly.

The second type of division leads to a concentration of the work area into a kitchenette for cooking, washing up, and storage, leaving the larger area for less specialised uses. One correspondent has worked this into an ar-

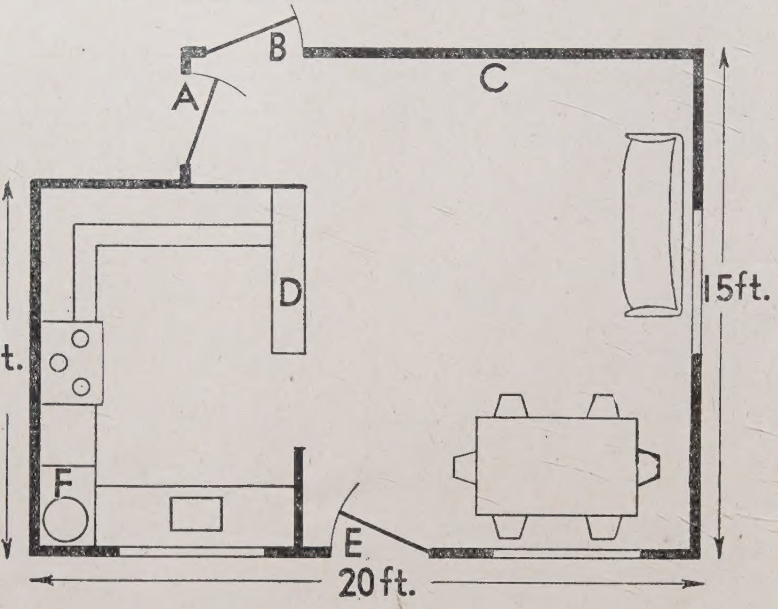

Fig. 3—A door to hall, B door to living-room, C fireplace (if desired), D 4ft. partition of cupboards opening in main room, E door to back porch, F hot-water cupboard.

rangement which can grow with the family. She writes: "I think the function of a farm kitchen changes as the family grows up. When they are less than five years old you must have them under your eye for the greater part of the day, but when this need passes a little privacy is enjoyable when working in your own domain. I rather favour a roomy dining-living room, large enough to have a fireplace, sofa and chairs at one end, and dining table or alcove at the other; then, opening off, a kitchenette containing range or electric stove, sink and cupboards, compactly arranged. The cupboards dividing this from the main room would be only shoulder high for easy vision when the family is young, and could be built up to the ceiling later on if desired. As the mother on a farm is usually the centre of the social activities (and this applies to the schoolchildren as much as to the babies), with this arrangement she can continue her work undisturbed and yet be seeing and hearing everything as well." The plan in Fig. 3 corresponds almost exactly with the arrangement described above, though it comes from another family.

Conversions

Many successful conversions to more convenient layouts have been made in the old-fashioned kitchen-scullery combination. Common among these is the installation of an electric stove in the scullery and an open fire to replace the fuel range in the kitchen. The dividing wall may have to be retained for structural reasons, but removing it altogether or altering it to form an archway or a partition of cupboards 3 to 5ft. high may make considerable additions to the amount of sun and light available. It often happens, for example, that the scullery is built on a corner and so cuts off many hours of sunshine from the kitchen, or the scullery may be cold and damp, with no means of heating, a gloomy and dismal place in which to spend much working time. Removing the division gives better ventilation to the work area and makes the whole room brighter.

If home planners profit by the scientific work which has been done on kitchen planning and from experiences such as these, they will avoid such mistakes as insufficient work surfaces, inaccessible cupboards, and bad lighting. Of course, in average homes compromises must be effected between what is desired and what can be afforded. The choice may have to be between larger floor space and more complete equipment, or between two pieces of equipment each desirable in itself. Nevertheless, omission of toe space between cupboards and the floor, electric wiring inadequate to meet the demands made upon it, lack of "safe" storage space, and similar defects should no longer be tolerated.

TE KUITI

TE Kuiti is a name pregnant with history and romance. It is the key word of a Maori saying, "Te Kuiti tanga o te Iwi Maori o nga hau e wha o Ao-tea-roa," which is translated: "The gathering place of the Maori people from all the wind-driven corners of New Zealand." This expression, now legend, was coined during the Maori Wars when non-combatant Natives, terrified by the destruction wrought by the guns of the invading white man, sought sanctuary in the verdant heart of the King Country, in a sunny, peaceful valley opening on to the eastern bank of the Mangaokewa stream, where stood the Pa, Kohaunui, ancestral home of the Maniapoto tribe.

So numerous were the refugees that the pa grew quickly, sprawling on both sides of the river. Several large meeting houses were erected where the populace could gather and fraternise according to Maori custom. The whare puni "Te Kuiti" held pride of place. By now the old name Kohaunui was dying out and the pa gradually assumed the name of "Te Kuiti." The gentle slopes above the pa were cultivated communally with the sharp, pointed wooden ko or spade. Large areas of wheat, kumaras, taros, and other crops were sown and harvested.

What halcyon hours the children spent, swimming in the clear stretches of the river nearby, leisurely causing it to yield its bounty of kaeau (black shellfish), crayfish, and eels; or pounding marbles into shape from the limestone rocks in the vicinity; or spinning tops and generally indulging in the sport and vigorous pursuits dear to the hearts of children.

When peace was proclaimed the families who had taken refuge there began to trek homewards. Soon only those who had intermarried with the original owners remained. Later on Europeans infiltrated into the King Country in steadily-increasing numbers. Eventually the Main Trunk line was put through and the township of Te Kuiti, already in the making at the north end of the pa where it meets the line, has flourished ever since—an important "gathering place" on the Main Trunk.—**"Te Kuiti-ite," King Country.**

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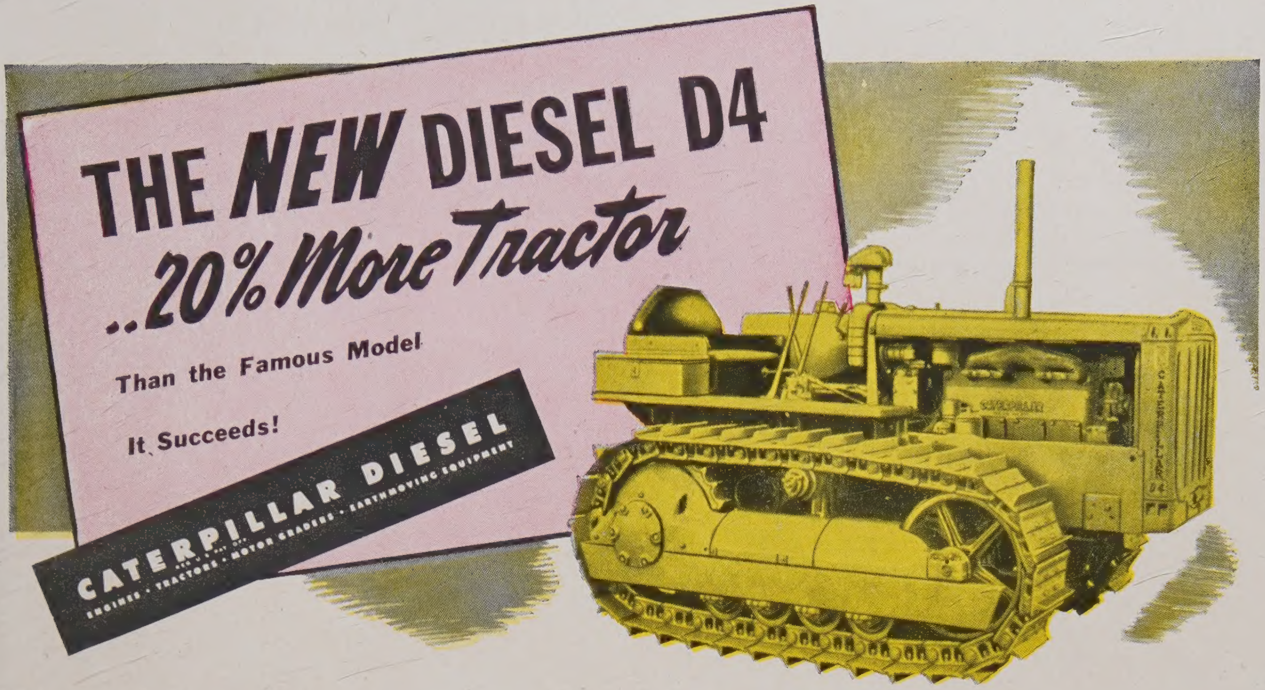
Printed by Blundell Bros. Ltd. (The Evening Post), Wellington—23451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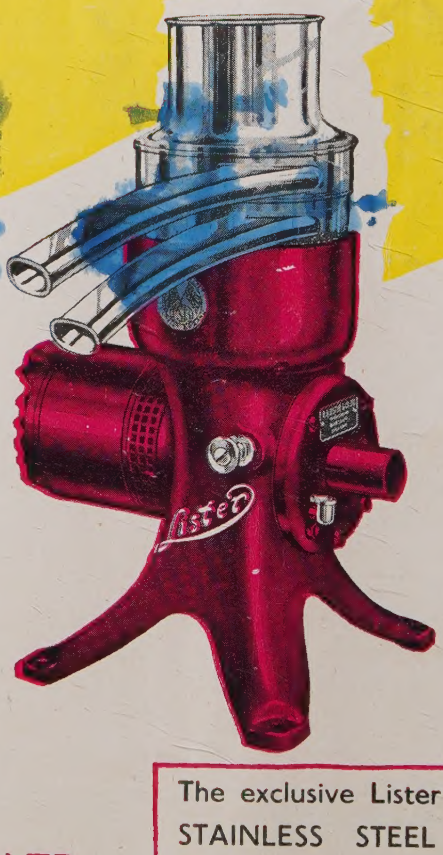

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